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DOCUMENTATION IN SUPPORT OF

Project Proposal

0803-1759

Entitled

A STUDY OF CALIFORNIA FORESTS

Sponsored by

U.S. Department of Agriculture

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION

Berkeley, California

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The documentation contained
herein was prepared under the direction of

E. I. Kotok

E. I. KOTOK, Director, California Forest
and Range Experiment Station

State of California
Northern District
Area 8
Alameda County
City of Berkeley

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Date

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PART I

STATEMENT OF INFORMATION

in support of Project Proposal

0803-1759

"A STUDY OF CALIFORNIA FORESTS"

The general objective of the proposed project is to carry on the research investigations of the California Forest and Range Experiment Station with a view to improving the administration and management of forest, range, and wild lands, and to make the yield of their natural resources permanent and with the greatest possible contribution of which they are capable to human welfare and prosperity.

These investigations are made for, and their results will be used by, an extremely wide variety of national, state and private interests. Among these are the administrators of national forest land in California, also the administrators of state park and forest lands. The results will be used by the lumber industry in the adjustment of their operations to the demands of public interest which will clearly be made in the relatively near future. The measures by which the deterioration of forage resources upon the range lands of the state, which has assumed serious proportions, may be arrested and these resources restored is of vital importance to the livestock industry of the state. The safeguarding of the water crop of the state through the management of forest and mountain lands, from which

it primarily originates, is of first importance to the agricultural interests of the state, as well as to industries, and all other citizens.

A. SUPERVISION

The project will be under the direction of E. I. Kotok, Director of the California Forest and Range Experiment Station, Berkeley, California. The various phases of the project will be supervised by members of the technical staff of the Experiment Station who are professionally qualified, and they in turn will be assisted by qualified WPA personnel now employed on the present project.

B. OBJECTIVES, USE OF DATA, AND RELATION OF PAST AND FUTURE WORK

Objectives and Use of Data.

1. Forest Management. Research in forest management in the redwood and pine regions is designed to bring about more conservative methods of timber cutting, increased growth of timber stands, and permanent forest productivity.

The objectives of the redwood section of the forest management study are (1) the preparation of reliable tables for use in determining the board foot volume of redwood trees; (2) to determine the effect of density of residual stand, exposure, slope gradient, disturbance (from logging, slash burning, etc.), logging slash, and competing vegetation on the establishment of natural reproduction on a selectively logged redwood area; and (3) to determine the rate of growth of planted redwood with respect to exposure, slope gradient and associated vegetation.

The redwood division will assemble information for use relative

to (1) the preparation of redwood volume tables; (2) the study of factors affecting the natural regeneration; and (3) the rate of growth of planted redwood trees.

There is urgent need for reliable redwood volume tables for use in redwood management studies for stand and tree volume determination. They are the basis for the analysis of rate of growth under different cutting systems and treatments designed to find the most profitable management methods, and so are of immediate practical value not only to forest research but to redwood lumbermen interested in getting the most out of their timber lands. All management and logging operations should be based on reliable volume determination. Volume tables are also essential to the proper evaluation of redwood stands for sale or purchase and are of importance now in connection with the contemplated purchase of redwood timber land by the federal government.

The regeneration of timber stands is of primary importance in forest management and is directly affected by the silvicultural system used and such woods practices as logging methods, slash disposal and fire prevention. Natural regeneration is apparently entirely practical in the redwood region provided the proper methods are used.

More than 25,000 acres of redwood cut-over lands were planted by lumbermen between 1922 and 1930 and it is of consequence to determine the importance of this effort because of its relation to the value of the several growth stands on the planted areas and as a means of determining the desirability of planting as a substitute for natural regeneration.

The objective of the pine section of this study is to aid in the compilation and analysis of data from the California Forest and Range Experiment Station field studies in many phases of forest management.

The results of the pine branch of this forest management study can be used to aid the promotion of better management of the pine forests of California. The results will determine better methods of silviculture for use on both private and public lands.

These forest management studies have an important long-time social value because they are essential to the development of a system that provides for the sustained production of the highest possible economic and social values on forest lands.

2. Range. The objective of the range study is to assemble and prepare research data from field projects devoted to the study of improved range management.

The range research data will be used in promoting the assembly, analysis, and dissemination of research findings on range problems and contributions toward their solution. This project involves the study of the development of practices which will permit the recovery of millions of acres of seriously depleted grazing lands and will bring about increased efficiency and prosperity in the livestock industry.

3. Fire Control. The objectivesof the fire research project are (1) Can weather measurements on the national forests provide us with a reliable index on fire danger? Which are the important weather elements? How are they to be correlated? and (2) What increases, changes, and adjustments are required in the fire protection facilities to provide better fire protection for California National Forests?

The purpose of this study is to determine, from a detailed analysis of field records, means and methods of improving forest fire protection in California. The results of the study will be used relative to the forest fire protection needs of 24,000,000 acres of land, including 18 national forests, under the protection of the federal government in California. The study has two main phases - (1) the study of fire reports of all fires on the national forests over the past 30 years to determine means and methods of improving forest fire protection practices; and (2) the study of current weather records and fire reports to ascertain if weather data can be utilized to determine the relative degree of fire danger to which a forest unit is currently exposed.

Studies in fire control are urgently needed since fire is one of the largest items of expense and loss to owners of forest and wild land property. It also contributes heavily to the destruction of the public services such as water conservation and erosion control which the forest should render.

4. Forest Influences. The objectives of the forest influences study are (1) to maintain and collect the records of lysimeters, surface run-off and erosion plots, hydrological and meteorological installations employed by the California Forest and Range Experiment Station at Berkeley to study the role of forest vegetation in the control of surface run-off and erosion in the production of the maximum usable water; (2) to conduct seed and plant research as related to forest influences work; (3) to tabulate, summarize, analyze and prepare for publication forest influence data collected at various field stations

situated in central and northern California; and (4) to maintain and operate a soils laboratory as a part of these forest influences studies.

The results of the forest influences studies will be used by the California Forest and Range Experiment Station and cooperating agencies in their flood and erosion control, water conservation, and administrative programs as a basis for watershed management practices throughout the state. In addition the results will be made available to the general public and interested agencies through various educational programs and popular and scientific publications.

The results of this study have an immediate and practical value in supplying information for the formulation of watershed management policies and for the improvement of existing watershed management practices with particular reference to flood and erosion control and water conservation. They have a long-time social and educational value in developing and maintaining long-time flood and erosion control and water conservation programs coincident with other land uses of the watersheds. Because of the seriousness of the flood and erosion situation in California, and because of the scarcity of water for urban and interurban uses, the maintenance and the future development of many of the agricultural industries of the state are dependent upon an adequate and efficient flood and erosion control and water conservation program.

5. Forest Products. On the forest products study the objective of the logging and milling studies is to determine if the costs and returns involved in manufacturing lumber from trees and logs of various

sizes yield results valuable both to the lumberman interested in costs and to the forester interested in sustained forest yield and public benefits. Specific objectives are - What are the comparative conversion values of the different sizes, species, and classes of trees in a mixed stand? What will be the increase, if any, in conversion costs to an operator who has been clear cutting if he changes his policy to one of leaving 20 or 30 percent of his stand in the smaller sizes of trees? What logging method is most economical for selective logging in the rugged topography of the West Slope California Pine Region? What combination of railroad spur construction and log skidding distance will give the lowest combined cost for yarding and road construction under varying conditions of stand and topography? How do the net values of trees of different species and sizes which are most desirable to leave from the standpoint of good silviculture and sustained yield management compare with the values of trees whose cutting is necessary if any real improvement of the stand is to be realized? What will be the operating costs and values recovered if a given stand is cut strictly according to the best silvicultural procedure? If a strictly silvicultural cutting will not yield sufficient returns to the operator, what is the best compromise that can be made between economical and silvicultural considerations? What are the most accurate methods of analyzing the costs of logging and converting different classes and sizes of logs and trees into lumber?

The immediate practical value of these timber harvesting and conversion investigations is in demonstrating the facts relative to the comparative financial aspect of different degress and systems of cutting timber lands in this region. They are part of a nation-wide program of similar investigations being conducted by the Forest Service, timberland owners, lumber companies, state forestry organizations and other related agencies. The studies are conducted so that operating and conversion costs and the selling values of the products yielded may be correlated with the independent variables of log size, log grade, tree size, tree class, stand density, stand composition, etc., to the end that each size and class of raw material occurring in the mixed stand may be separately appraised, and the average costs, values and margins calculated in advance of logging for any given system of cutting.

From the standpoint of long-time social value the results of these studies are necessary to show logging and lumbering operators how they may proceed economically in converting the unmanaged virgin forests into continuously productive managed forests for the benefit of the generations to come. In their application it is imperative that the results of timber harvesting and conversion studies be intimately coordinated with the results of silvicultural studies so that any cutting and management system recommended for a particular region, sub-region, or individual operation, shall be a well balanced formula giving proper weight to stand improvement and future yield.

The results of this study will be used by (1) the Experiment Station in promoting better practices on privately owned forest lands; (2) the Division of Timber Management in appraising prospective sales of publicly owned timber and formulating better management practices; and (3) the lumbermen's associations and private operators to apply the results in working out their management practices which will bring about sustained timber production within the shortest time commensurate with the necessity for maintaining a profitable operation throught the transition period from the unmanaged to the managed forest.

6. Forest Economics. The objective of the forest economics study is to show the maladjustments, both economic and social, which have resulted from wrong uses of land, to analyze their causes and effects and to provide direction and guidance for future land use which will contribute toward stabilized prosperity of communities and the perpetuation of the natural resources of the area.

The results of this study will be used in assisting in the assembly, tabulation, mapping, coloring, etc. of data, maps, and diagrams for the presentation of the land utilization report. The total report, as prepared in cooperation with the Giannini Foundation of the University of California, six California counties in the northern Sierra Nevada foothills region, and the Experiment Station will be used by executive agencies of land administration such as the U. S. Forest Service; state, county, and institutions in the planning of coordinated land use in its area; also by students and research workers in land utilization economics in respect to the organization and technique of such work.

7. Forest Survey. The objectives of the investigations in the field of forest survey are to obtain information concerning the types of vegetation, including forests, in California; the location and volume of timber stands; and the forest producing capacity of forest lands. The particular objectives are (1) to expedite the organization, measurement, computation, compilation, analysis and preparation for publication of field data collected on the Vegetation Type Survey and the Timber Inventory of California; (2) to publish on a quadrangle basis a picture of the vegetation in California and western Nevada showing the type and individual species distribution, and a collection of native plants for authenticating all species recorded on the vegetation type maps and sample plots; (3) to have a complete inventory of our timber resources including (a) present volume, growth and depletion phases, and possible future requirements of our commercial timber products, and (b) a description of our timber stands as to diameter and volume distribution by species, present condition as to site, stocking, quality, apparent vigor and accessibility. Objectives of the herbarium section of this study are to house in the herbarium a permanent record of the plants, with field information, collected by the type map field men, thereby authenticating data in reference to plant species published on the type maps; to make these materials accessible to other related agencies for study purposes; and to conduct research on various difficult plant groups with particular reference to field identification.

Data compiled by the forest survey branch of the Station's project has wide usage. The following is a list of agencies that have used the

data.

(1) U. S. Forest Service.

Copeland Report. Information was furnished on the extent and character of forest and potential forest land.

Land Use Planning Report for National Resources Board. This study provided a natural cover map basic in land use planning.

Ponderosa Way. Survey data was the basis for the location of this 900-mile fire-break and motor way, a major winter CCC camp project.

Land Use Planning Studies. (In cooperation with Giannini Foundation and the University of California.) Much of the basic data for the forestry and other aspects of the Eldorado County study were provided, as well as for a second broader study covering the Sierra foothills.

Forest Farm Project Reports. Data were supplied on forest and other cover in the preparation of three of these reports.

Brushfield Planting. Data aided in ground work planning preparatory to reforestation of brushfields on the Lassen National Forest.

San Joaquin Valley Range Survey. Data aided in groundwork planning, reduced amount of field work required and enabled undertaking the field work in one season which otherwise would not have been possible.

Fire Control and Transportation Planning. Data assisted in providing a basis for rating fire hazard.

Sustained Yield Units. The Forest Code office has used, and the Division of Timber Management is using, the data in planning sustained yield units.

Land Acquisition. Survey data were used in preparation of acquisition reports of the Tahoe National Forest.

Recreational Planning. Some data used by Office of Lands in its recreation planning.

Western Range Survey. Survey supplied data on areas of various classes of range lands in San Benito and San Diego Counties leading toward better management of such lands.

(2) Other Federal Agencies.

Division of Forest Insect Investigations. Forest survey study provided a map of ponderosa pine distribution used in locating permanent plots and applying the results of the plot observations.

Blister Rust Control. Provided map of sugar pine areas used in planning Ribes surveys preparatory to eradication work.

Division of Truck Crop Investigations. Provided map showing location of sagebrush types along west side of San Joaquin Valley used in life history studies of the sugar beet leaf hopper.

Bureau of Plant Industry. Ponderosa Pine Twig Blight Study made use of data on our distribution map of ponderosa pine in planning reconnaissance work.

Agricultural Adjustment Administration. Provided natural cover map used by the Land Planning Consultant of California in preparation of his report.

Resettlement Administration. Data used for planning grazing on two California projects.

National Park Service. Data used in fire control planning for three national parks in California were furnished by survey study. Data were also supplied for studies in insect control.

State Park Division of National Park Service. Data were used in acquisition and development planning for six park areas.

(3) State and County Agencies.

State Division of Forests and State Division of Parks have used data.

University of California has used survey data on Type of Farming Study, Range Livestock Phase of the Regional Agricultural Adjustment and Planning Project, Brush Control Study, Wildlife Habitat Studies, and Paleobotanical Studies.

Los Angeles County has used data for fire control planning.

Kern and San Mateo County Planning Commissions have used data for land classification.

Results obtained in the vegetation type map herbarium are used as a permanent record to authenticate information regarding plant species published on the maps issued by the vegetation type map division of the forest survey study. Other agencies which have made use of the herbarium studies are the University of California Herbarium, Dudley Herbarium at Stanford University, California Academy of Sciences, in San Francisco, and individuals who are specialists in their own particular field of systematic botany, as well as students of the University of California.

8. Forest Genetics. The forest genetics study consists of work in the fields of cytology and physiology. The objective of the physiological study is - How do trees grow? The objectives of the cytological study are - When does pollination occur? When does fertilization occur? When does macrospore formation occur? When are monocellular phases present in the macrogametophyte and when in the microgametophyte? What are the stages and what is the timing in the embryological development of the

experimental plants? What is the varyological setup in Pinus? At what stage does failure occur in incompatible crosses?

The data obtained from these studies will be used in the study of improvement of forest trees, particularly at the Station's branch at Placerville, California, - the Institute of Forest Genetics -, which is one of the few tree breeding stations.

9. Library Reference Work. Before the WPA workers were available the Station library had only an author listing of items in the library and other sources. Since then work has progressed in assigning subjects to these author references, and title cards have been made for books and pamphlets. The objective of the catalog is to answer the following: - What books, pamphlets, or magazine references by a certain author are in the library? Does the library contain a specific title of a book? What references does the library have on a special subject? What publications of a specific series does the library have?

The catalog, or card index, will be used to assist the research staff in locating references on various subjects. It is also used to a limited extent by members of the staff, and some students, of the University of California.

10. Statistical Section. The statistical section's objectives are (1) to make available the cooperation of trained statisticians in designing experiments; (2) to calculate, after data are obtained, the statistical measures necessary to make a statistical interpretation of the results which the project leader will incorporate with other findings involving a technical knowledge of forestry problems; and

(3) to perform efficiently those routine tabulations and computations which would otherwise require undue time and attention of the men of the Station's technical staff.

The tabulations and computations of data are used by the various divisions of the Experiment Station and related agencies. They represent the planned statistical analyses inherent in the problem or experiment as designed by the Station project leader. The uses of these results are dependent upon the study and topic under consideration.

Relation of Past and Future Work

The forest management, influences, fire, economics, products, survey, genetics, and library studies involve a continuation of the same type of work that has been done during the past two years. The range study is an entirely new one and is not really related to their past work. On the forest influences study 25 percent of the work to be performed in 1939 will be new work. On the forest products study new work will follow the same general outlines as that already accomplished only it will apply to other localities where the stand conditions differ from those previously covered. Closer coordination will be obtained in the library through their planned work.

The new work on the project will consist largely of the logical expansion of the old work and will be coordinated with it and will fully utilize the results of past investigations. While hitherto the main emphasis in many cases has been placed on the preparation of data, now the emphasis will be on the analysis phase. The work for 1939 will contribute to knowledge in the same fields and toward an increasing understanding of the problems.

The use of WPA employees will materially speed up progress in these investigations and assist in an early solution of important problems.

C. SCOPE OF PROJECT

The project will operate locally in Giannini Hall on the University of California campus and surrounding areas within Alameda County. Data for the various studies were obtained from various localities in California and western Nevada.

D. SOURCE OF DATA

This project is concerned mainly with data secured in our own investigations by members of the permanent staff of the California Forest and Range Experiment Station. Secondary sources of material play a minor part in the work. The field in which such secondary sources are most important are those of forest survey and of land utilization. The latter is a division of forest economics in which the material gathered by this Station in regard to forest and wild lands must be coordinated with data secured from other agencies. These agencies, however, are cooperating directly in the project and their materials are primary contributions to the whole investigation. Such cooperators are the U. S. Forest Service, California Region, in San Francisco; the Giannini Foundation; and other divisions of the University of California, Berkeley.

All of the work on the redwood management study is based on data collected between 1934 and the present time in the coastal regions of Humboldt and Mendocino Counties by technically trained members of the Station's staff. The bases of the redwood volume tables are measurements of the diameter outside the bark together with bark

thickness at designated intervals along the stem of redwood trees felled in logging (See CF&RES 396, page 30). The natural reproduction redwood study is based on a series of records taken during 1936-38 on 328 sample quadrats each 5 feet square or a total of 8,200 square feet sample units. Records from each square foot include number and height of each species of seedling, if present, exposure, slope gradient, severity of slash removal burn, density of various types of slash, and litter, and the height and density of the different associated plant groups (See CF&RES 531, page 31). Data used in the planted redwood study include 1937-38 measurements and records from 96 plots each with from 5 to 10 planted trees. The height and condition of the planted trees and associated vegetation were recorded and also site description including exposure, slope gradient and ground cover including vegetation and amount of slash and litter (See CF&RES 531, page 31). Also see CF&RES 355, page 32, as another source of data for the work on this redwood management study.

On the pine management study the data will be taken from original records collected by the Station's staff in connection with forest management research over a period of 30 years. Copy of a record of growth of an individual tree is shown on page 33. This is the type of data to be used.

The sources of data used by the range group are chiefly original field data sheets, maps, and photographic negatives from the pine-range phase of the work obtained during the period 1936-38. An example of original data, a sheet on changes in range forage brought about by logging, is shown on page 34.

The sources of the data used in the fire study are as follows: forest service individual fire reports for period 1910-38, Form 929, copy of which is shown on page 35; weather and other fire danger records collected on the national forests during the current years, form 1009, (See page 36); and other records and data on fire danger and fire action that are obtained from the Station's field men.

The source of data to be used on the influences study is original data collected by the Experiment Station from its various experimental installations in northern and central California since 1929. These installations comprise 13 watershed studies ranging in area from 20 to 600 acres, 30 1/40-acre surface run-off and erosion plots, 40 lysimeters, 10 weather stations and 2 experimental nurseries as well as 1 seed laboratory.

Sources of data on the forest products logging and milling studies are field investigations from original time studies, measurements, lumber tallies, made by members of this Station and cooperating agencies such as the Division of Forestry of the University of California; the Bureau of Entomology and Plant Quarantine, the Western Pine Association, and the lumber companies on whose operations the various studies have been conducted. Lumber selling prices used in the analysis have been collected by lumber companies and the Pine Association. See pages 44-65, inclusive.

Sources of data for the forest economics study are the climatic records of the U. S. Weather Bureau; topographic maps of the U. S. Geologic Survey; records of land ownerships obtained from county seats; maps of vegetational cover prepared by the Forest Survey division of this Station; detailed records of farm practices, costs and returns, secured by questionnaire and personal interview; data on forest properties timber stands, wood-using industries on county finances, taxation, tax delinquency, etc.

This information is for the counties of Amador, Eldorado, Placer, Nevada, Yuba and Butte.

The source of material for the survey division is the Vegetation Type Survey of the California Forest and Range Experiment Station under the direction of A. E. Wieslander. Approximately 44 percent of the field mapping has been completed. The secondary sources of material used are the U. S. Weather Bureau records of precipitation and temperature, the California Division of Mines map showing geological formations in areas under consideration, and the U. S. Forest Service and California State Division of Forestry reports on fires, and the resources of available libraries will be searched. The sources of material for the herbarium are the plant collections and appended field labels, and manuals used in plant identification and other books for research on the various plant groups, such as Jepson, Abram, and Munz, and taxonomic journals such as Madroño.

On the genetics study the data is "manufactured" and data will be derived from its study.

Source of data for the library is the current group of publications received at the library. Some of them are purchased but the greater part of them are received free from federal and state agencies. Foreign work is made available through translation.

The statistical section receives its data from the supervisors of the various research projects.

E. TECHNICAL PLANNING

The work done by WPA personnel is under the direct supervision of the Station's technically trained men who are assisted by well qualified WPA assistant supervisors. The rules of the United States Department of Agriculture and the Forest Service are followed. The following paragraphs cover the technical planning of the work to be done by the WPA

employees.

On the forest management redwood study they find that in spite of the urgent need for volume tables for reliable board feet volume determination of redwood trees no such tables are at present generally available. In fact the only redwood volume table known is one of limited application and of questionable value because it is applicable only to a very small area and to a utilization practice of several years ago and of only one company. Utilization standards vary from time to time and between companies so that volume tables to be generally reliable must be based on definitely established standards. In general the top diameter of the utilized part of the stem is roughly proportional to the basal diameter; therefore in the tables being prepared top diameters inside the bark are expressed as a percentage of the diameter at 20 feet above the ground. Tables will be prepared on the basis of 5 top diameter ratios - 50, 60, 70, 80, and 90 percent of the diameter at 20 feet, so that volumes of standing trees can be determined for any degree of utilization. The tables are being prepared by the methods devised by Schumacher and Hall and discussed in their book "Logarithmic Expression of Timber-Tree Volume."

The outline of procedure for volume tables is as follows: the taper curves are plotted; volumes are calculated to the 5 top diameter points; data are carded; equations are derived by the Doolittle method; this procedure is then combined for Humboldt and Mendocino County (it is worked up by lumber companies); volumes for trees by one inch diameter classes and 10 foot height classes are prepared for the range of diameter and height found for each top diameter ratio - this is done using diameter

inside bark and tables also for diameter outside bark at 20 feet. The next step is the relationship between the top diameter ratios calculated inside and outside the bark. Every step is checked by a worker other than the one making the original calculation. This work has been completed for Mendocino County and a portion of Humboldt County, and it is proposed to complete the study in the latter county.

Work on the redwood natural regeneration study is planned to summarize the progress to date on a long term study with no definite date set for completion. Sample plots were established and initial records and maps were made in 1936. Two examinations were made in 1937 and one with remapping of vegetation in 1938. Data from the field sheets (See page 31) for all 4 examinations will be transferred to cards (See page 32) this year. WPA work in 1939 will include a number of sortings of these cards with the compilation of totals and averages for each sort. The following group sortings will be made for Section 1 - the total number of seedlings by species and height will be determined; the average number of seedlings, by height classes, per square foot and per quadrat will then be determined and the average stocking on the basis of 1742 stocked quadrats per acre will be made; and additional analysis and computations may be included if found desirable. Other sortings to be made are - seedling abundance by 3 height classes in relation to exposure, degree of burn, type and density of slash and litter, density of residual stand, slope gradient, and vegetation type and density; vegetation succession; classification of area in quadrats for 1936 and 1938; and interrelationships of any of above factors.

The study of rate of growth of planted redwood trees is also a part of a study that will be continued for many years. The plots were established in 1937 and remeasured in 1938. Work assigned to WPA workers will consist of the computation of average rate of growth for each species for all plots and also a comparison of the average growth for the following groups - north and south exposures, four slope gradient classes and five classes based on dominant vegetation groups.

WPA assistance on the pine branch of the forest management study involves routine computing and drafting work. Technical planning in advance for this work is difficult as assignments vary considerably and each one must be outlined individually and closely supervised by the Station's technicians. The results of research activities will call for illustrative charts, maps etc., from time to time, and these will be planned as the need for them arises. To justify this work the pine group states that a large amount of data have been accumulated over a period of years and that future lines of research depend on results of past work. The WPA workers will facilitate the analyzing of tree growth records and other data which are on hand, enabling the regular employees to more adequately plan future studies.

The WPA work on the range study involves the compiling of data for which each short-time assignment will have to be explained and guided by technical supervision of our research staff; drafting work which includes map tracing, map lettering and chart lettering; and the coloring of lantern slides and photographs. Three years' original field data are available on range forage, forage utilization, cattle weights on mountain feed, changes in vegetation caused by logging,

and effect of cattle grazing on young tree growth and these data have only been partly compiled. Early completion of the compilation, for the basis of analysis, can be materially aided by the use of WPA workers on this project.

On the fire study it is planned to use WPA workers to codify all fire report forms for punching on Hollerith cards, to prepare punch cards from these codes, to operate checking, sorting and tabulating machines in obtaining summaries of data, and to work on the analysis of results including preparation of charts and graphs. Preliminary fire studies by Show and Kotok in U.S.D.A. Bulletins #209, 574, 1495, etc., have demonstrated conclusively the advantages of this type of research. It is proposed in this present analysis to extend these results by further and more detailed analyses of the same general type.

On the erosion streamflow study the following work will be undertaken: routine work in the seed laboratory and experimental nurseries, requiring approximately 8 men; 3 men will be needed on the lysimeter, run-off and erosion installations taking readings and keeping the records; 3 men will be employed in the hydraulics laboratory aiding in the experimental study of the San Dimas type of flume under various flows and bedload conditions; 3 men will be employed in the soils laboratory on soil analysis work in connection with the forest influences study making routine chemical analyses; and approximately 32 workers will be employed in tabulating, summarizing, analyzing, and preparing for publication data collected from the field installations.

The work to be assigned to WPA workers on the forest products lumber study consists entirely of compilation and analysis of the data collected in the field. Very little has been done by other agencies in the California Region in the particular kind of detailed lumbering investigations

covered by this study. Information derived from these studies may all be classed as new. Similar investigations have been carried on in other lumbering regions in the United States but the information resulting therefrom is of no practical value in this region. Not only do results differ widely as between different national regions but there are appreciable variations between sites and types even in one comparatively small sub-region.

The work of the WPA employees on the forest economics study will be routine compilation of data and drafting however no detailed analysis and schedule of future work can be made at present. The research work accomplished in land-utilization lines has produced results of widespread use to technicians in similar lines of work and to executive agencies charged with the administration of land. It has helped to blaze the trail toward a more stable and fruitful land use, a better coordination of economic activities, the reduction of unnecessary costs of local government, the prevention of economic suffering and the raising of standards of living. A previous bulletin of results of this kind is attached to page 37 to illustrate the kinds of inquiry and methods pursued on this branch of the project.

The work proposed for assignment to WPA workers on the forest survey study includes: (1) map publication, which involves the transfer of original field data; the preparation of type overlays which involves the transfer of data on type maps to a type overlay, showing symbols in their correct order of dominance and in the most likely position, and a color number is inserted within each type area representing the color to be used in publication; the preparation of timber overlays; area determination in acres by means of the planimetering of each vegetation type represented on the type map according to the classification which appears on the timber overlays, namely, the various subdivisions of virgin timber, second growth timber segregated into even and uneven-aged stands; deforested areas, and non-timber producing land; and computations and compilations of vegetation type and

timber stand areas by geological and political units. (2) The preparation of forest resource maps involves the combination of the vegetation type data with the data describing the timber classification and stand condition, further subdivided into manageable units for commercial timber operations. (3) On the species distribution maps dominant and individual occurrence for each species is shown, the compilation of such data being valuable for future study in the correlation of existing vegetation with various climatic and physical factors. (4) The bibliographical research in connection with this project involves a systematic search of library material from the earliest available dates to the present in respect to past fires and lumbering operations.

Work proposed for assignment on the herbarium division of the survey study consists of identification of specimens and routing determinations to the field men for their use in mapping the vegetation; mounting of specimens including pasting, strapping, typing labels and final filing in herbarium cases; distribution of duplicates to the Forest Service Herbarium in Washington, D.C., and the University of California; research on new species, range extensions, distributions, field keys, etc,; art work including drawing of specimens to be used in connection with publications and lettering of specimen folders; and observation in the field to further check herbarium studies. The WPA clerks on the project will do the purely routine work of preparing the field specimens in such a way that they may be kept as a permanent record and this involves mounting the material, recording it in card files, labeling and filing. The identification work and research must be done by the supervisor who is trained in systematic botany. All of this work will greatly facilitate research and encourage the publication of results and findings in reference to new species of plants, extension of ranges, etc.

In the library section the trained WPA librarian does the work that the clerks cannot handle such as preparing master catalog cards for books and pamphlets that have been reclassified and the other workers on this project type and file the routine library cards. All work is under the supervision of the Station librarian.

Technical planning on the statistical section is done according to approved methods described by authors of texts on statistical methods.

F. SPECIMEN FORMS

On the forest management study only general plans are made in advance by the redwood section. The detailed mechanics of the job are worked out as the need arises, consequently forms are not prepared much in advance as often minor changes are required as the work progresses. No series of forms, codes or flow-of-work charts are available on the pine section of this study. See pages 30, 31, 32, and 33 for forms from which data is obtained.

No forms are available at present that will be used on the range research study; however, page 22 shows a form from which data are obtained.

The fire group uses the forms on pages 38 to 43 inclusive in the coding of fire reports and in punching and tabulating on Hollerith machines. Original data from the fire reports are entered first on the forms numbered 4.11, 4.12, 4.21, and 4.22 and later are punched on corresponding cards.

There are approximately 250 different forms, charts and tabulation sheets used in the recording, tabulating, summarizing and analyzing of work on the erosion streamflow study. A set of these forms is included in the typed manual by W. E. Davis and P. B. Rowe, entitled "Procedure for Operating Field Installations and Compiling Data in Certain Watercycle Studies." This manual is needed continually on the project, and as there are very few copies it is considered sufficient to mention that it is available for the workers

and cannot be spared for any length of time.

Specimen forms used on the forest products logging study are shown on pages 66 to 79 inclusive. . Also see pages 44 to 65 for forms from which data are obtained.

There are no forms used on the forest economics study.

On the forest survey study form 535 is used by the workers in the bibliographical phase of the study. See pages 80 and 81 for specimen forms. On the vegetation type map phase of this study there are no forms available. On the herbarium branch of this study the following forms are used: - field label, see page 82, which is filled out when collection is made in the field by the collector; label for mounted specimen, see page 82, gives name of plant and exact locality, and is typed from field label after specimen has been mounted; quadrangle card and numerical file card, see page 83, which serves as a cross index so that every plant in the files can be located by quadrangle or herbarium number; form 767, see page 84, filled out in duplicate for all plant duplicates sent to the Herbarium in Washington, D.C.; annotation label, see page 84, for use in correcting or changing the scientific name on the herbarium label, which is pasted above the label on the mounted sheet; and J label, see page 85, which is made out for all material not worth mounting, and is filed in the folder with the mounted specimens of that species.

Specimen forms of the library cards are on pages 86 and 87. They are made in accordance with accepted library practices.

Special forms are not required in the statistical section.

G. INSTRUCTIONS TO WORKERS

On all of the various branches of this WPA project there is very close supervision of the work by members of the technical staff of the Station. For this reason instructions are not always available in typewritten form. It is often impossible to lay down hard and fast schedules, instructions, or flow-of-work charts as the procedure is new and in a constant state of development both here and among other research workers in this line, and the order of taking up specific phases is subject to unforseen contingencies.

On the forest management, range, products, economics, herbarium, statistical and genetics studies the workers are under the immediate supervision of members of the technical staff consequently verbal instructions are all that are necessary.

On the forest influences project procedure manuals and working plans have been prepared for the workers, but there is a very limited supply, and it is necessary to keep them on the project for reference by the workers. Written instructions for the workers in the fire and survey groups are also available for their use on the project, and close supervision by members of the Station's technical staff is maintained at all times.

The library uses the catalog rules of the American Library Association and supplementary Library of Congress rules; for filing they use the rules of the Cleveland Public Library.

See Section E, Technical Planning, page 20, for more detailed information applying to various phases of the project.

H. SCHEDULE OF OPERATIONS

This project will provide for supervisory, professional, skilled and unskilled assistance for a period of twelve months, starting approximately February 1, 1939.

I. COST ANALYSIS

For the approximate cost analysis of this project see page 5A of the project proposal - WPA Form 301-R.

J. PUBLICATION PLANS

Preliminary releases of research results are made through mimeographed Research Notes issued by this Station. Final reports are issued for official use. Publication of results is accomplished through technical and trade magazine articles, bulletins issued by the Government and bulletins or other forms of publications issued by cooperators, such as those of the Agricultural Experiment Station of the University of California. They will be financed by the Station or cooperators.

All publications issued by the Station in which WPA assistance is used will bear full acknowledgement, noting project number on which assistance is rendered. See additional information relative to publications on page 94.

CALIFORNIA FOREST & RANGE EXPERIMENT STATION

REDWOOD FELLED TREE ANALYSIS

CF&R.E.S. 396

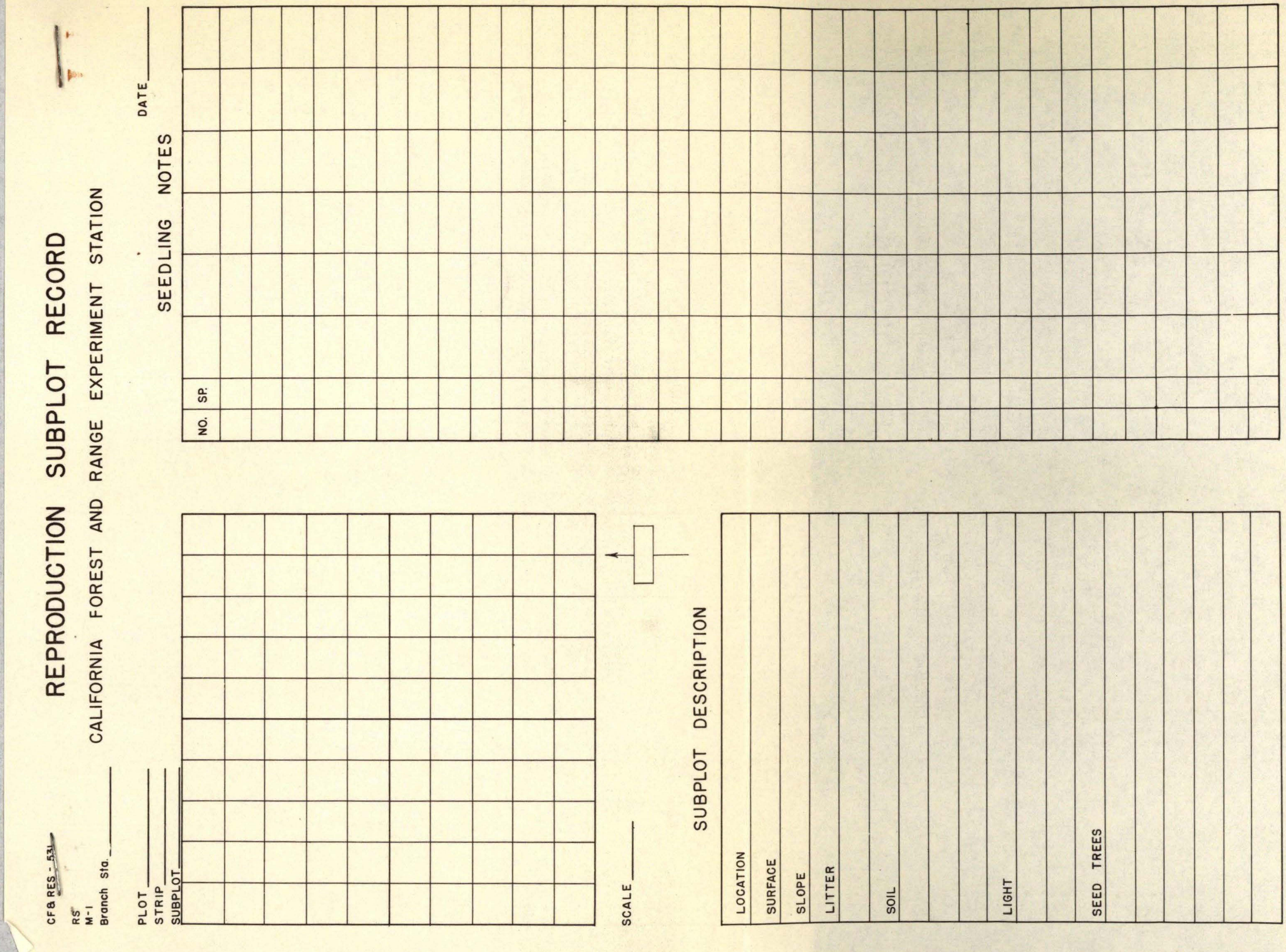
TREE NO.____ SPECIES____ DATE____ CREW____ CO.____

AGE____ SITE UNIT NO.____ CROWN CLASS____

HEIGHT ABOVE GROUND	LENGTH	D. O. B. HOR.	D. O. B. TAPE	D. O. B. AVE.	DBL. BARK	D. I. B. HOR.	D. I. B. TAPE	D. I. B. AVE.	LOG GRADE	KNOTS TOP HALF	NOTES

HEIGHT ABOVE GROUND	LENGTH	D. O. B. HOR.	D. O. B. TAPE	D. O. B. AVE.	DBL. BARK	D. I. B. HOR.	D. I. B. TAPE	D. I. B. AVE.	LOG GRADE	KNOTS TOP HALF	NOTES

This form, CF&RES 396, when completed by field men, provides the source of data for redwood volume tables.



This form, CF&RES 531, when completed by field men, provides the source of data for the natural reproduction redwood study.

C.F.&R.E.S.355 (OAKLAND-1-6-37-10000

HENRY CREEK REPRODUCTION PLOTS

Plot Date of Examination Quad

Slope Seed Trees

Exp. Veget.

Light Density Max. ht. Av. ht.

Notes

SEEDLINGS						BURN	STUMP		SLASH		W. FALL		BARK		TOTAL		OPEN	LITTER	VEGETATION			
R		D.F.		W.F.																		
NO.	HT.	NO.	HT.	NO.	ht.		ON	AB.	ON	AB.	ON	AB.	ON	AB.	ON	AB.			SPEC.	D.	A.	SH.

This form, CF&RES 355, when completed by field men, provides the source of data for natural reproduction redwood study.

GPO 8—5038

Fo 561

U. S. DEPT. OF AGRICULTURE—FOREST SERVICE

TREE DESCRIPTION

Tree No. 153

Project M Plumas *N. F. Plot* S-1 *Species* SP

DATE	D. B. H.	HEIGHT			BOLE CONDITION	VIGOR	CROWN					AGE CLASS	SEED CROP	REMARKS
		BASE OF CROWN	CLEAR	TOTAL			WIDTH	L'NGTH	D'NS'TY	TOP	CLASS			
5/_/11	17.0	24		63	5	M	M	L		M	D			C'
Notes:														
	17.4	16	44	63	C	M	M	L		F	D	YM		C'-D
Notes:														
	17.5			65	O P Y					d	C		6	
Notes:										↳25'				
	18.1			65		M	M	L		St	C	"	6	C'
Notes:														

Elevation { *Absolute* _____ *Relative* _____ *Slope* S *Exposure* SW *Site* _____ *Type* _____

Form 561 - Growth record for an individual tree, serving as a source of data on pine management study.

RR
Burgess Spring
Logging disturbance

Vegetation Plot No. 11.9 - 5.5 Examiner TWD
August 9, 1935

Sub Plot	No.	Species	Area Sq.in.	No. of plants	Height cms	Fascicles	Other notes
392.04 A	1	Stipa occidentalis	.03				
	2	" "	.03				
	3	" "	.03				
	4	" "	.03				
	5	" "	.03				
	Total		.15	5			
	6	Rock	8.00				
	7	Bare soil	100.00				
	8	Litter (needles)	283.89				
392.04 B	1	Stipa occidentalis	.03				
	2	" "	.03				
	Total		.06	2			
	3	Wyethia Mollis		1		1	
	4	Gayophytum		1	8		
	5	Bare soil	75.00				
	6	Litter (needles)	316.98				
392.04 C	1	Festuca Idahoensis	1.00				
	2	Poa sandbergii	.25				
	3	" "	.10	2			
	Total		.35				
	4	Carex sp.	.60				
	5	" "	.05				
	6	" "	.05				
	7	" "	.03				
	8	" "	.30				
	9	" "	.10				
	10	" "	.05				
	11	" "	.05				
	12	" "	.65	9			
	Total		1.88				
	13	Wyethia Mollis		1		1	
	14	Litter (needles)	388.81				
392.04 D	1	Carex sp.	.30				
	2	Wyethia mollis		1		3	
	3	Litter (rotten wood, needles)	366.74				
	4	Windfall	25.00				Dia. 14"

Source of data, completed in field, used on range study.

Form 929 B-C
Revised May 1935

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

INDIVIDUAL FIRE REPORT

"B" AND "C" FIRES
(Read instructions below with care before preparing report)

Forest _____
Ranger Dist. _____
County _____
T. _____ R. _____ Sec. _____ Mer. _____

Scale 1" or 2"=1 mile (indicate which).

*If caused by fuel sparks, give measured distance from point of origin to center of track _____ feet.

Name of fire _____
Date _____, 193 (Fire started)

State _____

Reportable fire _____ (See instructions—Check one) Nonreportable fire _____ (Nonstatistical)

Ranger's No. _____ Supervisor's No. _____

CAUSE OF FIRE
(Check one)

Lightning _____
Railroad (not lumbering): Fuel sparks* _____ Other _____ (Specify cause, brakeshoes, clearing right of way, etc.)
Lumbering: Donkeys _____ Railroads,* loaders _____ (Include brakeshoes) Friction _____ (Exclude brakeshoes) Slash burning _____ Other _____ (Specify cause)
Campfire _____
Smokers _____
Débris burning _____ (Not R. R. or lumbering)
Incendiary _____ (See instructions) No. of sets _____
Miscellaneous: Burning building _____ Power lines _____ Automotive equipment _____ Other _____ (Specify cause)

SOURCE OF PEOPLE RESPONSIBLE
(Check one)

Local _____ Outsider _____

CLASS OF PEOPLE RESPONSIBLE
(Check one)

Traveler _____ Fisherman _____ Hunter _____
Stockman _____ Rancher _____ Miner _____
Timberman _____ Others _____ (Specify class)

PHYSICAL CONDITIONS
(At point of origin)

Ground cover _____ (Duff, litter, slash, brush, grass, reprod., etc.)
Slope _____ % _____ Exposure _____ (NE., SW., etc.)
Fire started near base ____ Middle ____ Top of slope ____ Level ____ (Check one)
Altitude, approximate _____
Material first ignited _____ (Grass, rotten wood, needles, snag, duff, slash, moss on tree)
Wind rate _____ Direction _____ (Give velocity in Beaufort scale (see below) When fire first reached)
Wind rate _____ Direction _____ (During biggest run of fire)
Grazed heavy _____ Medium _____ Light _____ Ungrazed _____

POINT OF ORIGIN

a. On N. F. lands _____
b. On other lands inside N. F. _____
c. On protected lands outside N. F. _____
d. On unprotected lands outside N. F. _____
e. Started outside and entered N. F. protection unit _____ (Yes or No)
f. Fought by the F. S. outside the N. F. protection unit, and kept from entering it _____ (Yes or No)

CHARACTER

	On arrival	Subsequently
Surface fire (See the glossary)		
Duff or ground fire		
Crown fire		

CLASSIFICATION
(Check one)

B _____ (Over ¼ A.—less than 10 A.)
C _____ (10 acres or over)

ACTION TAKEN
→(Fill in all spaces)←

	Date 193	TIME RECORD Hour	A. M. P. M.	ELAPSED TIME RECORD Hour	Min.	Instructions
1. Time of origin: Guess _____ Known _____ (Check to indicate which. Record as known, if known within 15 minutes)				XX	XX	XXXXXXX
2. First discovered by _____ (Primary, L. O. fireman, miner, rancher, etc.) Name _____ Title _____ (Smoke chaser, per diem, hunter, etc.) From _____ (Name of place) DIST. FROM FIRE _____ feet or _____ miles						Discovery Time (difference between 1 and 2)
3. Next sighted by _____ Name _____ Voluntary ____ or requested ____ sight Title _____ From _____ (Name of place) DIST. FROM FIRE _____ feet or _____ miles				XX	XX	XXXXXXX
4. Reported to _____ (Includes checking) Name _____ Title _____ (Party responsible for action) At _____ (Name of place) By _____ (Name of person reporting)				XX	XX	XXXXXXX
5. First report rec'd by _____ Name _____ Title _____ (Person to go to fire) At _____ (Name of place)						Report Time (difference between 2 and 5)
6. Name _____ Title _____ (Of first man to go to fire) Left _____ (Name of place) for fire with _____ (Give number) men						Get-away Time (difference between 5 and 6)
7. Traveled _____ (No. of miles or feet) by _____ (Means of conveyance) and _____ (No. of miles or feet) by _____ (Means of conveyance) Arrived at fire						Travel Time (difference between 6 and 7
8. Travel time includes _____ hrs. _____ min. hunting fire after reaching its vicinity or place it was reported	XXX	XXX	XXX	XX	XX	XXXXXXX
9. Elapsed time from origin to arrival of first man	XXX	XXX	XXX			Difference between 1 and 7
10. Elapsed time from first discovery to arrival	XXX	XXX	XXX			Difference between 2 and 7
11. Name _____ Title _____ with _____ men started work (Of person first starting work or of man in charge if a crew begins work)						Start to first work (difference between 1 and 11)
12. Reinforcements arrived: First _____ (Number) men at _____ (Hour and date) Second _____ (Number) men at _____ (Hour and date)	First	Reinforce	ments			Difference between 2 and 12
13. Fire corralled (the spread stopped by linework or natural barriers—often some mop up yet to be done)						Corral Time (difference between 7 and 13)
14. Fire controlled (control line completed and mopped up to point of safety)						Control Time (difference between 7 and 14)
15. Fire out (all men released)						Difference between 14 and 15

16. Probable area when discovered _____ (Acres or sq. ft.) Area when reached _____ (Acres or sq. ft.) Final area _____ (Acres) Maximum number men engaged at one time _____ (Year long forest officers) _____ (All others)
17. Approximate number of man-hours (exclusive of travel time): To corral _____ Mop up and patrol _____ (After corralling) Total _____
18. Approximate length of line actually built to corral ____ (Chains) Approximate length of control line lost ____ (Chains) Perimeter of fire when reached ____ (Chains) When corralled ____ (Chains) When controlled ____ (Chains)
19. Number of chains of fire line built per man-hour up to time of coralling _____ chains. (Exclude primary travel time. Include all men on the fire—laborers, cooks, F. O.'s, etc.)

LAW ENFORCEMENT RECORD

_____ (Name of owner of land where fire started)
(If no action taken on man-caused fire explain why on back of form)

Fire actionable _____ (See the definition below) Nonactionable _____
Individuals responsible: Known _____ Suspected _____
Name and address _____
_____
Criminal case: Won _____ Lost _____ Pending _____
Civil case: Won _____ Lost _____ Pending _____
Settled out of court _____
Amount collected: Fines, $_____ (Omitting court costs) Damages, $_____ (Including suppression cost paid)

VISIBILITY.—Is the point where the fire started, in:

	Number of Fire Control Stations 1	2	3
Direct visibility from— (See instructions below)			
Indirect visibility from—			

In a blind area _____ (Yes or no)

(R) ANALYSIS OF ACTION TAKEN, ETC.

A. REASON FOR EXTRA PERIOD FIRES (fires not corralled and held before the heat of day following discovery or following the day of invasion from "outside"). Be ultracritical; assign to *one* of following "reasons," if practicable:

1. Lookouts spread too thinly ____ 2. Other fire personnel spread too thinly ____ 3. Detection failure due to smoke or fog ____ 4. Out of season, guards off ____ 5. Failure of U. S. F. S. personnel (year long) ____ 6. Failure of U. S. F. S. personnel (guards) ____ 7. Failure of cooperator (F. S. prot. area only) ____ 8. Failure to recognize emergency conditions ____ 9. Failure to handle removable special danger ____ 10. Failure to use speediest methods ____ or, 11. Equipment ____ in line construction. 12. Inadequate planning of attack ____ (Crew, tools, etc.) 13. Insufficient night work ____ 14. Started from large fires outside F. S. prot. area not threatening in its earlier stages ____ 15. Inaccessible areas, lack of roads or trails ____ 16. Remoteness from labor supply ____ 17. Extreme weather conditions (rare) ____ 18. Other ____ (Specify)

Use of the following paragraphs, B to I, is required in Regions 1, 4, 5, 6; optional elsewhere
(Make entries in paragraphs A and B only, if fire was handled by cooperator)

B. DISCOVERY TIME: 1. If discovery time exceeds Regional Standard of ____ minutes, check reasons below. 2. Smoke not visible above tree tops ____ 3. Lookout man failure ____ 4. Fire too far from lookout ____ 5. Smoke or haze ____ 6. Lookout not occupied ____ 7. Fire at night ____ 8. Other ____ (Specify)

C. REPORT TIME: 1. If report time exceeds the Regional Standard of ____ min., check reason. 2. Uncertain of existence or location of fire. ____ 3. Telephone system out of order ____ 4. No one available to receive or transmit report ____ 5. Dispatcher seeking confirmation of location ____ 6. Other ____ (Specify)

D. GET-AWAY TIME: 1. If get-away time exceeds the Regional Standard of ____ min., check reason. 2. Seeking confirmation ____ 3. Gathering men ____ 4. Stopping to eat ____ 5. Handling this fire as one of series ____ 6. Not prepared to go ____ 7. Why? ____ 8. Other ____ (Specify)

E. TRAVEL TIME: 1. If elapsed travel time exceeds that set as standard on hour control map, or Regional Standard rates of travel, check reason. 2. Got lost ____ 3. Took wrong route ____ 4. Used wrong means of transportation ____ 5. Night travel across country ____ 6. Stopped to pick up men en route ____ 7. Loafed or stopped en route ____ 8. Location of fire erroneous ____ 9. Hunting for fire ____ 10. Work on other fire en route ____ ¶11. Average miles per hour ____ 12. Was this satisfactory speed? ____ 13. Fire not chased by nearest man ____ If not, explain in "Remarks." 14. Other ____ (Specify)

F. ATTACK TIME: 1. If there was delay between arrival at fire and start of work, check reason. 2. Setting up camp ____ 3. Going for help ____ 4. Hunting for clues ____ 5. Other ____ (Specify)

G. LOSS OF LINE: 1. If any line lost, check reasons: 2. Improperly mopped up ____ 3. Improper location ____ 4. Not burned out clean ____ 5. High wind ____ 6. Lack of patrol ____ 7. Patrol not functioning ____ 8. Snags not felled ____ 9. Spot fires ____ 10. Poorly constructed line ____ 11. Failure to back-fire in time ____ 12. Other ____ (Specify)

Fill out in duplicate—one copy for Rangers, one for Supervisor's files

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EXPLANATORY NOTES
(READ CAREFULLY)

"Other land"—Wherever used on this form includes all non-National Forest lands, such as private, State, Indian, etc.

"Protected land" includes all areas which are recognized by Federal or State agencies as being under organized protection.

"N. F. Protection Unit"—An area under protection of the U. S. F. S. It may include some lands outside the National Forests.

NONREPORTABLE (NONSTATISTICAL) FIRES

Fires of the classes described below should not be included in the regular annual statistical records. If desired, however, for other uses, reports on some of these classes of fires may be required but should be conspicuously marked "nonreportable."

1. Fires originating on area protected by Forest Service under the following circumstances:
   (*a*) Fires confined to private lands which are controlled by and reported to the State by owners or organized agencies other than the Forest Service which do or do not endanger National Forest or contributing private land, even if Forest officers investigate or inspect them or give assistance at no outlay by the Forest Service other than salaries and minor expenses of the regular administrative and protective forces.
   (*b*) Fires originating in burning buildings, haystacks, or sawdust piles, which do not spread or actually endanger National Forest protected lands.
   (*c*) Small fires, usually less than ¼ acre, which spread from burning slash on Forest Service sales or improvement projects and which are suppressed by the crews in charge of the slash disposal. If handled by suppression crews they are reportable fires.
   (*d*) Spot or small fires usually less than ¼ acre on either National Forest or private lands, started by lumbering or other industrial operations which are immediately extinguished by private employees hired for that purpose, such as watchmen at donkeys, patrolmen, etc.
   (*e*) Fires, usually less than ¼ acre, spreading from lawful brush or slash fires confined to private lands which are controlled by agencies other than the Forest Service, even if Forest officers do contribute time or nominal expense to them.
   (*f*) Fires which can not spread to adjacent inflammable material from live coals of abandoned camp fires in prepared pits or fireplaces or in areas naturally devoid of fuel such as gravel bars.
   (*g*) Railroad fires: (1) Fires, usually less than ¼ acre, on the right of way which burn out naturally or which are extinguished by railroad employees; (2) live coals found between the rails; (3) fires handled by other agencies, which spread from the right of way but which do not threaten National Forest or cooperative land protected by the Forest Service, even though Forest officers may contribute time to investigation or inspection or may render nominal assistance on the line; report being made to or by the State.
   (*h*) Fires, including lighting fires, less than 10 acres in size which are out when reached by the first fire fighter. This includes fires of this class discovered, searched for, and found or not found.
   (*i*) Spot fires and hang-over fires which escape after being controlled will not be reported as separate fires. Report original fire in the usual way and cover subsequent events under "Remarks."
2. Fires in unprotected territory adjacent to the National Forest which do not enter the National Forest and do not require any cash outlay by the Forest Service. (The same policy as for 1 (*a*) above.)
3. Fires, usually less than ¼ acre, in territory protected by other recognized agencies where Forest Service cooperation consists only of contributed time and nominal cash expense. Where such fires enter areas protected by the Forest Service or where substantial expenditures are made to protect National Forest interests, they are reportable, but the expense incurred by others and the burned acreage and damage on areas protected by others will not be included. This condition should be explained under "Remarks."

NOTE.—All fires which occur outside the exterior boundaries of National Forest protection units and on which a Forest officer contributes a small amount of time and incurs no other expense are: (*j*) Reportable, if they endanger National Forest protection units and are not controlled by other parties; (*k*) nonreportable, if they do not endanger National Forest protection units; (*l*) nonreportable, if they do endanger National Forest protection areas and are controlled by others with the minor aid of Forest officers.

F, 8, 9, 10. Insert the numbers of the preceding items which were used "successfully," for "mop up," etc., viz: "10. Mop up 2–5–6."

F, 11—DIRECT METHOD.—Working immediately at the edge of the fire (see the Glossary of Terms Used in Fire Control for more details).
TWO-FOOT METHOD.—Building fire line not over 2 feet from edge of fire, usually not back-fired out.
PARALLEL METHOD.—Building fire line parallel to but usually 6 to 100 feet from edge of fire and immediately burning out intervening strip.
INDIRECT METHOD.—Building fire line considerable distance in advance of fire and then back-firing. Utilizes roads, rims, etc.

MAP.—Outline boundaries of fires over 10 acres. Use (X) to indicate the point of origin. Indicate scale used. Show section numbers in center of squares. Indicate non-Federal land and show whether or not contributing. Indicate ownership of noncontributing land if information is available. Map all fires of 100 acres or more in size on a separate sheet, and show timber types, daily spread of fire, and contours if available from U. S. G. S. or other maps.

CAUSES.—See the Glossary of Terms Used in Fire Control for terms not defined below.

LOCAL.—Refers to people who live on or adjacent to the Forest, including small towns near by.

TRAVELER.—Refers to any transient who can not be more definitely classified.

ACTION TAKEN.—Be sure to supply all information called for in the elapsed time record.

CONTROL LINE.—Give paced lengths, including only length of line upon which actual work was applied. Total perimeter is the total distance around the burned area, including both worked and unworked sections.

Primary travel time=to first arrival at fire.

WIND VELOCITY.—"Light," rustles leaves; "Gentle," extends light flag; "Moderate," sways small branches; "Fresh," sways small trees; "Strong," sways large branches; "Gale," breaks smaller branches.

INCENDIARY FIRES.—The principle to govern in reporting on the many possible variations is: A group of fires set in *close proximity* to each other by the same party at one time will be given one name and reported on only one report as one fire, providing the "sets" could reasonably have been handled by the first attacking party as one fire, i. e., a fire line could reasonably have encompassed several of them as one fire. Otherwise, each "set" or group of sets will be reported as individual fires.

NUMBER OF SETS.—If several sets are handled as one fire and reported as one fire, state here the number of sets included in the group so reported. If separate reports are made for the sets do not show them here.

"FIRE ACTIONABLE."—Fires starting or being allowed to spread in violation of laws or regulations, or where there is an implied agreement or statutory obligation to compensate the Forest Service for its work in suppressing such fires. A "Nonreportable" fire may in some cases be "actionable."

VISIBILITY.—Disregard whether or not the stations were occupied when this fire started. For definitions of "Direct," "Indirect," and "Blind" see the Glossary of Terms Used in Fire Control, 1930. Include as "fire control stations" all stations regularly depended upon for detection service—include per diem guards and other cooperators only for indirect visibility where so depended upon. Exclude all emergency guard stations.

(R) ANALYSIS OF ACTION TAKEN.—Instructions regarding the method to be followed by the Supervisor in obtaining this information will be issued by each Regional Forester. 1. If two reasons are given for any fire, parenthesize the less important.

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(P) AREA BURNED—ACRES—TYPES—DAMAGE

(For CLASS B fires. Show only one timber type and make entries only in blocks A, B, C, D, if applicable, and in column (7). Use ocular estimates and omit the map unless high values are involved)

(Follow instructions below for each column—entries should be to nearest whole dollar or whole acre)

FIRE STARTED IN _____ (Timber) TYPE (Supervisor will enter the "Rating," "Zone," and "Value" figures) FIRE STARTED IN _____ (Green forest; cutover; old burn single—double; brush; grass; other) FUEL TYPE

MAJOR TIMBER TYPE (See instructions for symbols)	A TOTAL AREA (acres)	B NONPRODUCTIVE FOREST OR AREA (Subdivision of column A)				C MATURE OR MERCHANTABLE (Exclusive cut-over areas—E) (Subdivision of column A)				D REPRODUCTION OR YOUNG GROWTH (Merchantable types only) (Subdivision of column A)				
		No forest or protection value (acres) (a)	Protection forest or area			Acres (d)	Access. zone (e)	M B. M. killed (f)	Value (2)	(g) Acres satisfactorily stocked			Site (h)	Value (3)
			Acres (b)	Rating (c)	Value (1)					Age 1–20	Age 21–40	Age 41–60		
National Forest														
† (12) Total net N. F.														
Other lands inside														
(13) Total other inside														
(14) Total within N. F. boundaries (Lines 12+13)														
Outside (15) Protected														
Outside (16) Unprotected														
(17) Grand total (Lines 14, 15, 16)														

(P)—Continued. (Note that all figures in parenthesis are triplications. See instructions below)

MAJOR TIMBER TYPE (Continued) (See instructions for symbols)	E CUT-OVER (Subdivision of column A)					F MISCELLANEOUS AREAS "Old burn"_____ Blow down_____ Bug killed_____ Plantations_____ (Check one) (Subdivision of column A)				G LIVESTOCK FORAGE (Subdivision of col. A)		All values by types (values 1 to 6, inclusive)	Of total area burned in each timber type, how many acres of complete kill?	Acres burned due to avoidable errors in fire control methods
	Year cut (f)	Slash burned (acres) (k)	Slash not burned (acres) (l)	M B. M. killed mature trees (m)	Value of mature trees (4)	Year of burn, blow down, etc. (n)	Acres Stocked (o)	Acres Unstocked (p)	Plantation value (5)	Acres (r)	Value (6)	(7)	(s)	(t)
National Forest														
† (12) Total net N. F.														
Other lands inside														
(13) Total other inside														
(14) Total within N. F. boundaries (Lines 12+13)														
Outside (15) Protected														
Outside (16) Unprotected														
(17) Grand total (Lines 14, 15, 16)														

(8) Improvements and other values, $_____ (Exclusive of improvements) (9) Recreation values, $_____ (10) Game values, $_____ (11) Grand total values, $_____ (Sum of cols. 7, 8, 9, 10)

† If only one type is involved, the figures need not be carried down and repeated in the total columns 12, 13, 14, and 17.

(Q) SUPPRESSION COSTS

(See instructions)

DIRECT COSTS FROM FOREST SERVICE AND DEPOSITED OR OBLIGATED COOPERATIVE FUNDS

ITEMS	COSTS
(a) Labor (salaries or wages)	
(b) Subsistence supplies	
(c) Other supplies	
(d) Equipment	
(e) Transportation	
TOTAL OF ABOVE	
(f) Salary and expense of forest officers	
GRAND TOTAL (X)	

(h) DISTRIBUTION OF GRAND TOTAL (X) BY FIRES ON BASIS OF AREA OF EACH CLASS OF LAND BURNED

CLASS	COSTS
National forest land	
Private land inside	
Outside land	
TOTAL SAME AS (X)	

For fires on private land attach slip showing for each ownership:

Area burned _____, and owner _____

COSTS NOT PAID FROM FOREST SERVICE, OBLIGATED OR DEPOSITED COOPERATIVE FUNDS

(i) NAME OF COMPANY OR PERSONS OR CHARACTER OF SERVICES GIVEN	SERVICE AND VALUE MAN-HOURS	VALUE	VALUE OF OTHER SERVICES	TOTAL

(j) FOREST OFFICERS' TIME, SALARY, AND EXPENSE (see instructions)

NAME	TITLE	HOURS	COST

(R) ANALYSIS OF ACTION TAKEN, ETC.—Continued

H. CONTROL: 1. Special equipment used. 2. Back pack pump _____ (Ave. hours) 3. Tank truck _____ (Hours) 4. Horse and plow _____ (Chains) 5. Tractor _____ (Chains) 6. Power pump _____ (Hours) 7. Other _____ (Specify) 8. Successful _____ (Insert applicable numbers, see explanatory notes) 9. Used for original attack _____ or 10. Mop up _____

11.

Methods used ⟶	Direct	Two-foot	Parallel	Indirect
Approx. amt. of line built (mi. or chs.)				
Approx. amt. of line lost (mi. or chs.)				

Reasons for nonuse:

Plow _____

Pumps (back pack, power) _____

Tractor _____

I. SPEED OF LINE CONSTRUCTION: 1. If any of the following could have speeded up line building, check. 2. Narrower line _____ 3. Use of horse and plow _____ 4. Use of power equipment _____ 5. More bosses _____ 6. More felling and cutting tools available _____ 7. Burning out line as rapidly as constructed _____ 8. Minimizing man power on patrol through assigning definite individual marked beats _____ 9. Length of road, trail, driveway, etc., used as held fire line: Road _____ (Chains) Trail _____ (Chains) Driveway _____ (Chains) Other _____ (Chains) Water _____ (Chains) Firebreak _____ (Chains) 10. Were any of these available and not used? _____ 11. Why? _____ 12. Better detailed location of line to avoid difficult or dangerous construction or to shorten length of line _____ 13. Less width in clearing trees and brush for the control line _____ 14. Use of lights to facilitate night work _____ 15. Other _____

Remarks: _____

Are areas repeated in triplicate in section (P) shown properly in parenthesis? _____ Nonparenthesized totals of subdivisions equal column A total? _____

EXAMINED AND APPROVED

Date _____, 19____

_____ Supervisor.

Is this fire being reported to the State by any other agency? _____ (Yes or No) _____ (Date report is written)

_____ (Name of agency) _____ (Signature of reporting officer)

U. S. GOVERNMENT PRINTING OFFICE 8—7629

(Detach when report is completed)

INSTRUCTIONS AND EXPLANATORY NOTES (BY COLUMN DESIGNATIONS)

(P) AREA BURNED, etc. Actually measure all fires—estimates of area will not do. For non-National Forest lands damage estimates will be the best obtainable without making extended examinations.

For greater detail see Forester's O-Fire, Damage Appraisal Circular of April 27, 1925. Ocular estimates for Class B fires will be adequate unless high values are involved.

A. Gross area of fire by ownership classes and types.

Note that all other acreage columns are subdivisions of column A. Accordingly all acreage figures should always be shown twice; once in column A and again in one of the subdivisions. In some cases they should be shown a third time, in whole or in part. *Always place in parenthesis any figure which is reported a third time;* the parenthesis being placed about the figures in the less important subdivision. For example: If 100 acres of merchantable timber are burned over and on 50 acres of the same area is a stand of reproduction, beneath the mature trees, then report 100 acres in both columns A and (*d*) and place (50) acres, in parenthesis, in columns (*g*). *The sum of the nonparenthesized figures should always equal the column A total.* Protection forest acreage should be shown in columns A and (*b*). See instructions for columns (7) and F.

Supervisor will fill in damage value figures except for improvements, etc., in column (8), which will be shown by the reporting officer. If timber will be salvaged, the quantity and value salvaged should not appear in the "Damage" block but should be mentioned under "Remarks."

B. Enter no timbered acreages here unless in an unquestionably and defined inaccessible zone.

(*a*) Lands incapable of bearing forests, such as bogs, bare rock, and land devoted to agriculture and other nonforest uses.

(*b*) Of watershed protection value only; timber, brush, grass, etc.

(*c*) Ratings 1 to 17, inclusive. Great damage+intensive use=1. See page 54, Washington Conference Report.

(1) $1.00 per acre of area shown in column (*b*). Loss in terms of M B. M. not shown.

C. (*d*) All timber-bearing lands, including woodland possibly merchantable. Exclude timber in protection forests.

(*e*) See page 2, Forester's O-Fire letter of April 27, 1925. If no zones established, leave space blank.

(2) Total from rates by zones based on Forester's Circular of April 27, 1925.

D. (*g*) All reproduction should be grouped in the three age classes shown and the acreage of each group placed in the proper column. The area is the number of burned-over acres which had over 100 young trees per acre before the fire, and which had less than this number after the fire. The balance of the area, which was not fully stocked, place usually in column (*r*). Include in parenthesis second growth under merchantable stands and reproduction on cut-over, burned-over, etc., areas.

(*h*) Show as "Good," "Medium," or "Poor."

(3) Based on Forester's Circular of April 27, 1925.

E. (*m*) Seed trees and other timber left after cutting.

(4) For mature timber such as seed trees use the same rates as for column (2). Repeat in columns (*g*) the area of reproduction and show value of reproduction in column (3).

F–G. If more than one check mark is appropriate subdivide columns accordingly and explain in "Remarks." If the area burned in block F or G is a subdivision of block B, be sure to enter without parenthesis in block B and to parenthesize in block F or G.

(*n*) The year of the previous burn; of the blow down; of the bug attack, or of the planting.

(*o*) The age of the reproduction may be determined from (*n*).

(*p*) Less than 100 young trees per acre before this recent fire occurred.

(5) Repeat in columns (*g*) the area of natural reproduction and in column (3) its value. Enter here only the value of the plantation.

(*s*) *Complete* kill of all material above the surface. Includes acres which may restock naturally from roots, etc. Sum of acres of *complete* kill of timber types in columns (*b*) (*d*) (*g*) (*k*) (*l*) (*o*). No parenthesized areas to be included.

(6) Value at local rates, and only if fire measurably affects the handling of livestock.

(7) To be consistent with the value of $1.00 per acre for damage to protection forests the total damage to productive forests having watershed protection value should not be less than an average of $1.00 per acre; i. e., the total acres in column A minus column (*a*) should not be a higher figure than the total dollars shown in column (7) unless forests of no watershed value are involved. Any increases to column (7) to make this balance should be shown in parenthesis in column (*b*) and without parenthesis in column (1).

(8) Itemize under "Remarks"—Include only buildings, autos, etc., burned as a result of the oncoming fire; not if they were the cause of the forest fire. Segregate burned logs, and other forest products similarly under process of manufacture in one group under "Remarks."

(9) See Regional instructions.

(10) See Regional instructions.

(Q) The cost figures will be entered in pencil by the ranger. If the Region rules that they must check exactly with the 19h record, final entries will be made by the Supervisor.

(*a*) All salaries and wages paid from F. F., deposited or obligated cooperative for suppression, including commissary charges and salaries of emergency guards while on suppression. Do not include contributed time of forest officers paid from other funds. See item (*j*).

(*c*) Include cost of all expendable equipment and supplies except subsistence supplies.

(*d*) Include cost of all semi and nonexpendable equipment purchased from F. F. and/or cooperative and charged to suppression.

(*f*) Time and expenses of forest officers from item (*j*).

(*j*) Contributed time and expenses of forest officers paid from other than F. F. Under "Hours" report total number of hours charged to this fire on form 26. Costs will be inserted by the Supervisor; time costs on basis of form 34–a figures and expenses from expenditure records. "Forest Officers" is intended to include all guards except those paid from F. F.

REMARKS.—Be brief but report all facts. Use extra sheets, if necessary, to record all pertinent facts.

8—7629

STANDARD FIRE DAMAGE TIMBER TYPES AND SYMBOLS

Only the regional type symbols as shown below should be used. If one or more species, aside from the principal one, are present to an important extent in the stand, the symbols for the less important type (species) may follow the symbol for the predominating type, viz.: WP—C—LF. Ordinarily the types shown should be limited, and without combination, to those shown below. Reference O-Fire letter, January 8, 1931.

REGION 1		REGION 2		REGION 3		REGION 4		REGION 5		REGION 6		REGION 7		REGION 8		REGION 9	
TYPE	SYMBOL	TYPE	SYMBOL	TYPE	SYMBOL	TYPE	SYMBOL	TYPE	SYMBOL	TYPE	SYMBOL	TYPE	SYMBOL	TYPE	SYMBOL	TYPE	SYMBOL
No natural vegetation	N. V.	No natural vegetation	N. V.	No natural vegetation	N. V.	No natural vegetation	N. V.	No natural vegetation	N. V.	No natural vegetation	N. V.	No natural vegetation	N. V.	No natural vegetation	N. V.	No natural vegetation	N. V.
Grass	Gr.	Grassland, Sagebrush	Gr.–Sgb.	Grass	Gr.	Grass	Gr.	Grass	Gr.	If moss covered add to symbol	Moss	Grass	Gr.	Grass	Gr.	Grass and Muskeg	Gr.
Brush	Br.	Brush	Br.	Sagebrush	Gr.–Sgb.	Sagebrush	Gr.–Sgb.	Brush	Br.	Grass and brush	Gr.–Br.	Brush	Br.	Muskeg	Gr.–Mk.	Brush	Br.
Woodland	Wd.	Woodland, pinon, juniper	Wd.–PJ	Brush	Br.	Brush	Br.	Chamiso and chaparral	Br.–Ch.–Chp.	Woodland and hardwoods	Wd.	Northern hardwood	NH	Brush	Br.	Aspen	A
Yellow pine	YP	Aspen	A	Woodland, oak	Wd.–O	Woodland, pinon, juniper	Wd.–PJ	Woodland, hardwood	Wd.–Hdw.	Lodgepole pine	LP	Appalachian hardwood	AH	Scrub	Sc.	Northern hardwood	NH
White pine	WP	Yellow pine	YP	Woodland, pinon, juniper	Wd.–PJ	Woodland, oak	Wd.–O	Woodland, pinon, juniper	Wd.–PJ	Western yellow pine or sugar pine	YP	Southern hardwood	SH	Spruce	Sp.	Southern hardwood	SH
Lodgepole	LP	Lodgepole	LP	Aspen	A	Aspen	A	Yellow pine	YP	Douglas fir, pure or mixture	DF	Longleaf pine	YPLL	White spruce, birch	Sp.–B	Spruce, Tamarack	Sp.–T
Douglas fir	DF	Douglas fir	DF	Yellow pine	YP	Yellow pine	YP	Yellow pine, fir	YP–F	True fir, mt. hemlock, pure or mixture	F	Slash pine	YPSL	Hemlock	H	White pine	WP
White fir	F–WF	White fir	F–WF	Douglas fir	DF	Lodgepole	LP	Lodgepole	LP	Larch, white fir, Douglas fir (N. slope, E. side)	La.–F	Loblolly pine	YPLob.	Cedar	C	Yellow pine, Norway	YP–N
Spruce	Sp.	Spruce	Sp.	Spruce	Sp.	Lodgepole, Douglas fir	LP–DF	Douglas fir	DF	Western hemlock, or western red cedar, with or without Sitka spruce	H–C	Shortleaf pine	YPSh.	Subalpine	Alp.	Yellow pine, Jack	YP–J
Larch–Fir	L–F	Subalpine	Alp.			Douglas fir	DF	Fir	F			Pitch-Pond, Sand-Virginia	YPPPS			Cedar	C
Cedar, hemlock	C–H					Fir	F	Fir, Sugar pine,	F–SP	Alpine fir, with or without lodgepole	Alp.	Pine, hardwood	YPH				
Subalpine	Alp.					Spruce	Sp.	Mixed conifer	MC			White pine	WP				
						Larch Douglas fir	La.–DF	Subalpine	Alp.			Spruce	Sp.				
						Subalpine	Alp.	Yellow pine, Douglas fir	YP–DF			Swamp	Swp.				

Form 929 B-C, source of data used on the fire study.

Form No. ~~1009-E~~

Station ______ Forest ______ County ______ State ______

Sec. ______ Twp. ______ Range ______
Meridian ______
Lat. ______ Long. ______

U. S. DEPARTMENT OF AGRICULTURE

WEATHER BUREAU

Elev. ______
Pres. Table ______

Time used ______ th Meridian

Year ______
Month ______
Days ______ to ______ incl.

TIME		TEMPERATURE					HUMIDITY			WIND					CLOUDS			WEATHER		PRECIPITATION				LIGHTNING						MISC.			
Date	Time of Observation	Maximum	Minimum	(a) Mean	Dry bulb	Wet bulb	Relative humidity	(a) Vapor Pressure	(a) Dew Pt.	Direction	Velocity	24-hour movement	(a) Av. hourly Velocity	Prevailing direction	Amounts (Tenths)	Kind	Direction	State of weather	Character of day	Character	Time of beginning	Time of ending	Amount	Time first sighted	Direction and distance	Direction of travel	Time ended or last sighted	% Lightning confined to clouds	Number of fires resulting				REMARKS
(a) SUMS																																	
(a) MEANS																																	

Relative humidity computed by ______, Address ______

No entry to be made by observer in columns marked (a)

8—5841

______ *Observer.*

Form 1009-E, source of data for the fire study.

The Utilization of El Dorado County Land.

U. of C., College of Agriculture, Agricultural Experiment Station, Berkeley, California.

Technical planning on the economics study is for a publication similar to Bulletin 572.

4.11
CF&RES-
490

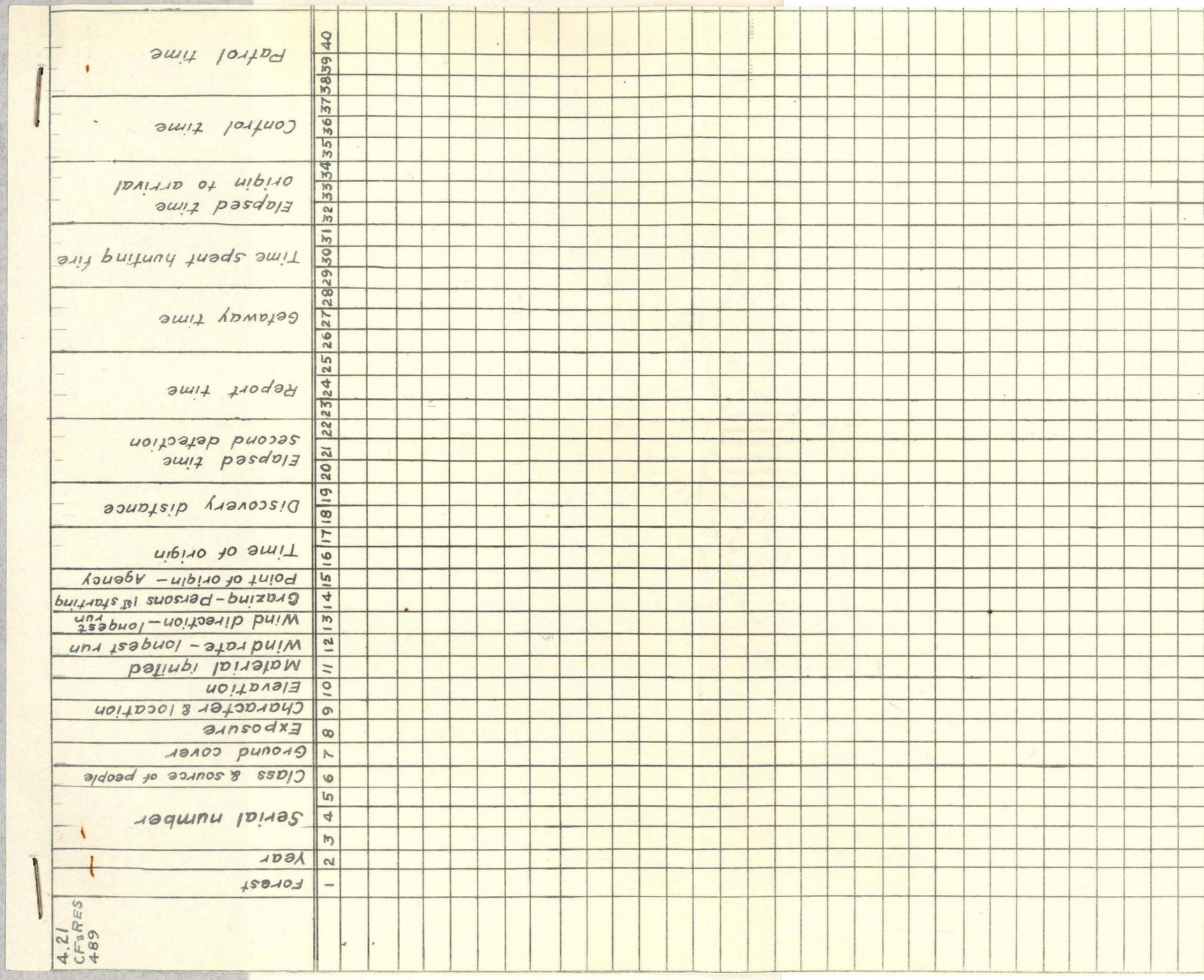
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Forest																																								
Year																																							
Serial number																																							
Month																																							
Day																																							
Location																																							
Occurrence & hazard zones																																							
Cause & classification																																							
Slope																																							
Wind rate when reached																																							
Time of discovery																																							
Elapsed time Origin to discovery																																							
Distance traveled by car																																							
Distance traveled by foot																																							
Total distance																																							
Travel time																																							
No. men starting work																																							
Elapsed time discovery to arrival																																							
Men in 1st reenforcement																																							

CF&RES 490, 4.11, specimen form used in the coding of fire reports.

4.12
CF&RES-
491

40 41	Men in 2nd reenforcement
42 43 44	Elapsed time discovery to arrival 1st reenforcement
45 46 47	Elapsed time discovery to arrival 2nd reenforcement
48 49 50	Elapsed time arrival to corral
51 52 53	Perimeter of fire when discovered
54 55 56 57 58	Total man hours to corral
59 60 61 62	Chains of line built to corral
63 64 65	Perimeter of fire when reached
66 67 68 69	Perimeter of fire when controlled
70 71 72	Chains of line per man hour to corral
73 74	Rate of initial spread
75 76 77 78	Ratio = Final perimeter / Perim. at arrival
79	Type fire started in
80	Equipment used

CF&RES 491, 4.12, specimen form used in the coding of fire reports.



CF&RES 489, 4.21, specimen form used in the coding of fire reports.

4.22
CF&RES-
488

41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Area when discovered			Area when reached			Final area					Maximum no. men used			Man hours patrol and mop up				Control line lost			Visibility	Loss of line		Cost					Resistance to control		Fire danger rating		Class of day					

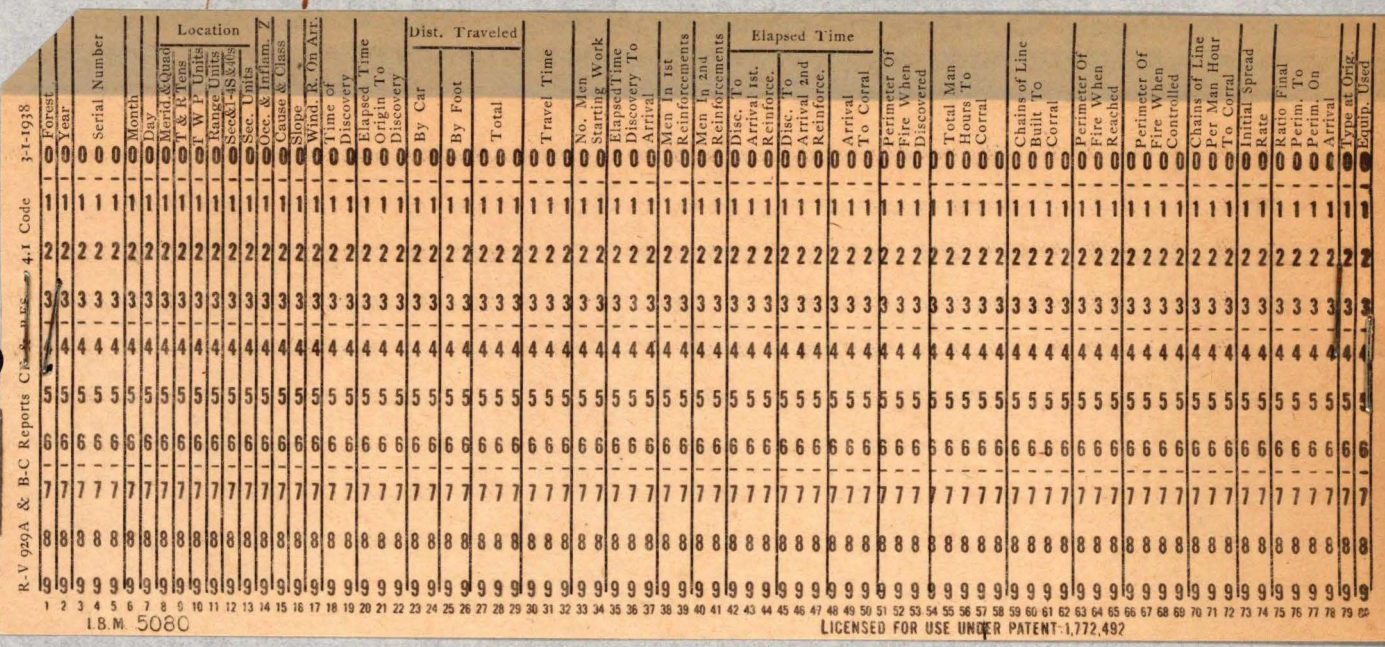
CF&RES 488, 4.22, specimen form used in the coding of fire reports.

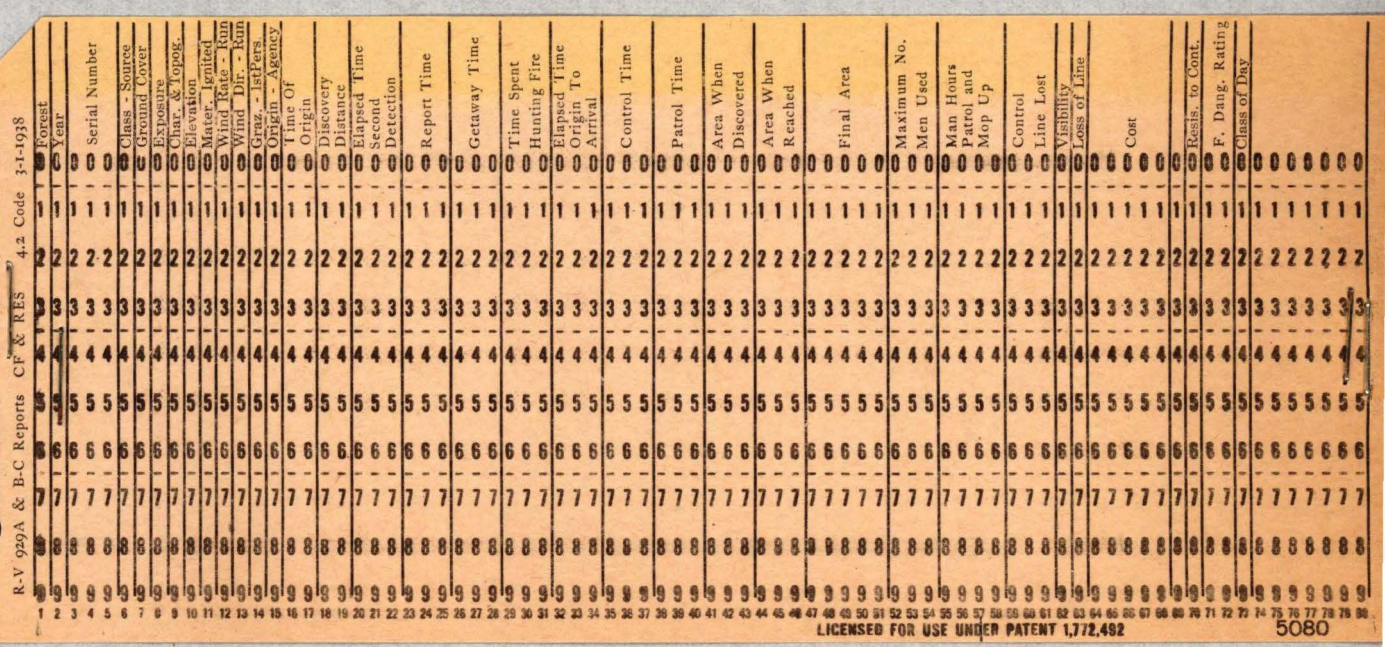
Page ___

_____ FORREST

YEAR	Serial Number	LOCATION								Section Number	Quarter Section								Meridian				Rate of Initial Spread	Intran. Zone
		TOWNSHIP				RANGE					NE 40 A.		NW 40 A.		SW 40 A.		SE 40 A.		HM	MD	SB	WM		
		NORTH		SOUTH		EAST		WEST																
		4	5	6	7	4	7	5	6															

Specimen form used in coding fire reports.





Specimen forms used in punching and tabulating fire code data on Hollerith machines.

WOODS STUDIES
For Exp. Sta.
Form W 4

(Ogden-5-2-29-1500)

FELLED TREE ANALYSIS

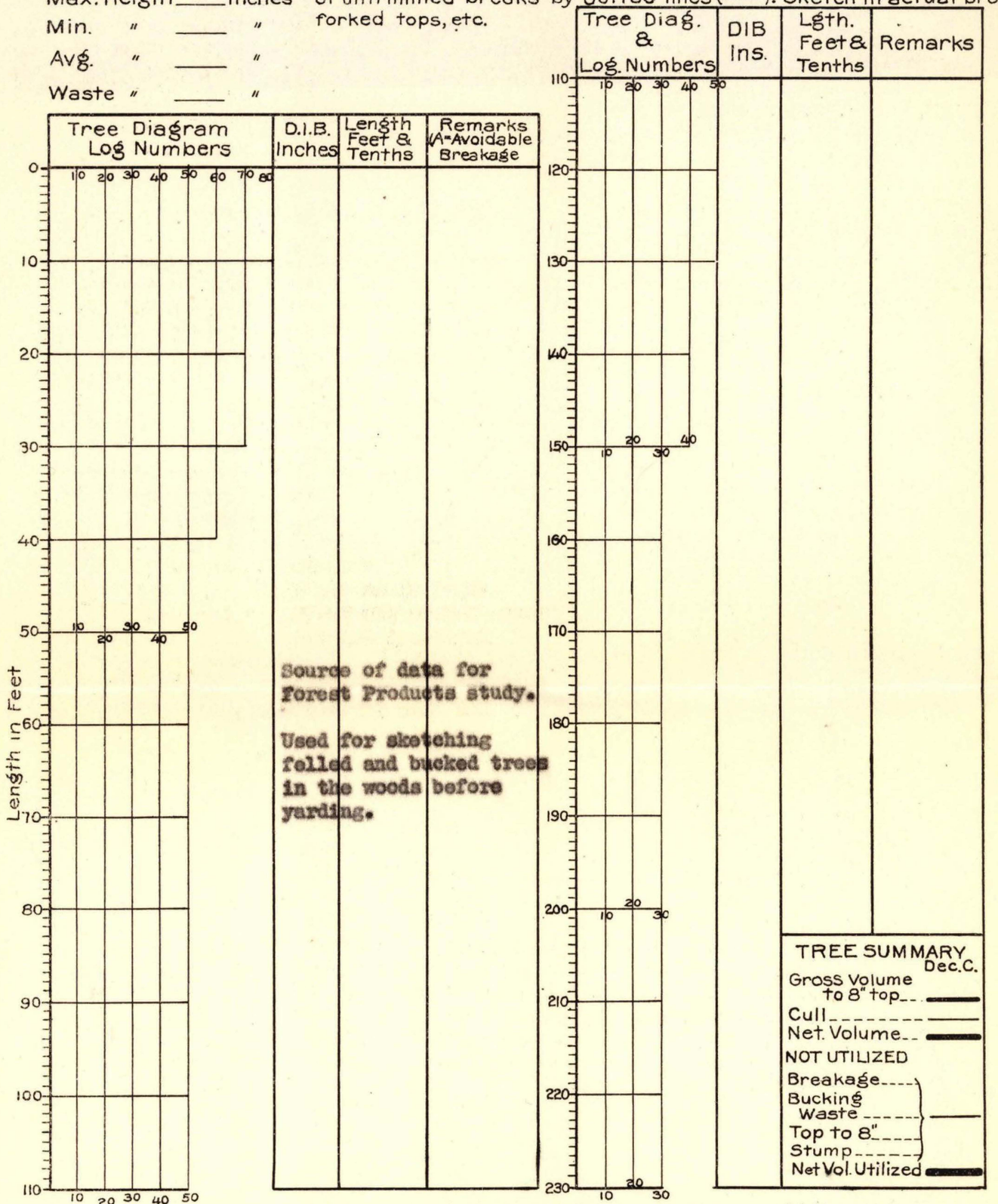
N.F. _____
Project _____
Date _____

TREE NO. _____
Species _____
Tree Class _____
D.B.H. _____
Tot. Hgt. _____

STUMP

Max. Height ____ Inches
Min. " ____ "
Avg. " ____ "
Waste " ____ "

INSTRUCTIONS: In diagram show actual sawcuts by solid lines (——). Show probable cuts to be made on mill deck and merch. limits in case of untrimmed breaks by dotted lines (- - -). Sketch in actual breaks, forked tops, etc.



Note: Measure D.I.B. of unmerch. top at approx. middle point between tip and saw-cut.

Source of data for products study.

SCALE			LOG GRADE									TREE NO
WOODS	CAR	MILL	WOODS	U.S.F.	MILL		BR BRAND	KN KNOT	BURL BURL	BUMPS	SCARS	BARK
						145						
						140						
						135						
				9		130						
						125						
						120						
				8		115						
						110						
						105						
				7		100						
						95						
						90						
						85						
				6		80						
						75						
						70						
				5		65						
						60						
						55						
				4		50						
						45						
						40						
				3		35						
						30						
						25						
				2		20						
						15						
						10						
						5						
				1								

Source of data for Forest Products study.

Form used for diagrams of trees in the redwood region study of 1935.

TREE MEASUREMENTS

Spec. ;Class ;Field No. ;

	Length, ft. Woods	Mill	Diameter, in's. o.b.	Bark %	i.b.	Scale Log dec.C	r.	Notes
DBH	xxx	xxx				xxx	xx	
ST		xxx					xx	

TREE MEASUREMENTS

Spec. ;Class ;Field No. ;

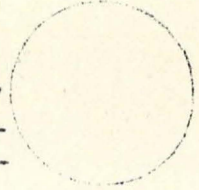
	Length, ft. Woods	Mill	Diameter, in's. o.b.	Bark %	i.b.	Scale Log dec.C	r.	Notes
DBH	xxx	xxx				xxx	xx	
ST.		xxx					xx	

Source of data for Forest Products study.

Form used for recording felled tree measurements, pine region.

FELLING Date _____
Tree No. _____ Spec. _____ DBH _____

STUMP
Ht. ins.
L _____
H _____



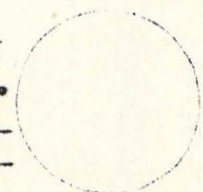
SUMMARY, man-min.

Move _____.
SWamp _____.
Under-
cut _____.
Bark _____.
Saw _____.
Wedge _____.
Tools _____.
STub _____.
Rest _____.
Other _____.

AB A B

FELLING Date _____
Tree No. _____ Spec. _____ DBH _____

STUMP
Ht. ins.
L _____
H _____



SUMMARY, man-min.

Move _____.
SWamp _____.
Under-
cut _____.
Bark _____.
Saw _____.
Wedge _____.
Tools _____.
STub _____.
Rest _____.
Other _____.

AB A B

Source of data for Forest Products study.

Form for felling time studies of individual trees.

RP FORM #34

LIMBING TIME STUDY

Date _____ Timer _____

Tree No.____ Sp.____ DBH____ Ht.____ Spots____ D.Cl____ K.Cl____ Comp't _____

Arrive tree _____ Leave tree _____ Elapsed time on tree _____ Limber _____

Log	Lgth	Dia	Class	Chop	Saw	Tools	Rest	Move	Other	Total	
1B											Leave this tree _____
2											
3											
4											
5											
6											
7											
8											
9											Arrive next tree _____
T											Dist.ft _____ Travel _____

RP FORM #34

LIMBING TIME STUDY

Date _____ Timer _____

Tree No.____ Sp.____ DBH____ Ht.____ Spots____ D.Cl____ K.Cl____ Comp't _____

Arriv tree _____ Leave tree _____ Elapsed time on tree _____ Limber _____

Log	Lgth	Dia	Class	Chop	Saw	Tools	Rest	Move	Other	Total	
1B											Leave this tree _____
2											
3											
4											
5											
6											
7											
8											
9											Arrive next tree _____
T											Dist.ft. _____ Travel _____

Source of data for Forest Products study.

Form for lumbering studies.

BUCKING Date Spec.
Tree No. Pos.
DOB Bark thk x2
DIB Lgth Slope

TIME

SUMMARY
Man-min.
mkMark .
Move .
SWamp .
Saw .
Chop .
Wedge .
Under-cut .
Tools .
Rest .
Other .

BUCKING Date Spec.
Tree No. Pos.
DOB Bark thk x2
DIB Lgth Slope

TIME

SUMMARY
Man-min.
mkMark .
Move .
SWamp .
Saw .
Chop .
Wedge .
Under-cut .
Tools .
Rest .
Other .

BUCKING Date Spec.
Tree No. Pos.
DOB Bark thk x2
DIB Lgth Slope

TIME

SUMMARY
Man-min.
mkMark .
Move .
SWamp .
Saw .
Chop .
Wedge .
Under-cut .
Tools .
Rest .
Other .

BUCKING Date Spec.
Tree No. Pos.
DOB Bark thk x2
DIB Lgth Slope

TIME

SUMMARY
Man-min.
mkMark .
Move .
SWamp .
Saw .
Chop .
Wedge .
Under-cut .
Tools .
Rest .
Other .

Source of data for Forest Products study.

Form for bucking time studies by individual logs.

(OAKLAND-7-13-34-10,000)

CALIFORNIA FOREST EXPERIMENT STATION

YARDING STUDY LOGGING TIME

Date........ Crew........ Co........ Setting........

Road No........ Turn No........ Kind equip........

Stop Watch	Ord. Watch	Act. Time	Slope %	Dist. ft.	Activity and Sta. No.

Source of data for Forest Products study.

Yarding time study form for running entries

Log. No.	Dia.	Length	Scale Gross	Scale Net	Log No.	Dia.	Length	Scale Gross	Scale Net

YARDING TIME STUDY

Turn _____ Landing _____ Date _____ Timer _____

Distance _____ Road _____ Comp't. _____ Tractor _____

WATCH	ACTIVITY	TIME	WATCH	ACTIVITY	TIME
End turn _____			Total, TIME Column _____		
Began turn _____					
Difference _____					

Turn _____ Ldg. _____ Date _____

Distance _____ Road _____ Comp't. _____ Tractor _____

Log Number	D. I. B. Sm.	D. I. B. Lg.	Length W.	Length M.	Gross Scale	Cubic Feet	Pro-rated Time In-Out	Pro-rated Time H-UH	Delay Time	Cause
										Ldg.
										WC
										TT
										Ser.
										AT
										Line
										RHC
										PU-DL
										HU
										SQ
										Clr.
TOTAL										

Source of data for Forest Products study.

Yarding study form designed for prorating to logs without copying again on separate office forms.

In Ratio _____

H-UH _____

A	B	C	D	E	F	G	H	I	J

CF&RES 511

RF FORM #35

LOADING TIME STUDY

Load No. ______ Date ______

Truck No. ________ Landing ____________ Comp't. ________ Observer ________

Total Elapsed Time

LogNo	Sp	Diameter Sm	Diameter Lg	L	DecC Sc Gro	DecC Sc C	Kind def.	Cu.ft	Net time	Dist	Time Entries	
											Start of Turn	:
Total Log Time											End of Turn	:

Prorated work time, Adjust load ________
Yarding in ________
____
____
____
Total effective ________

Delay time, Spot
Waiting for tractors ________
Waiting for trucks ________
No. logs ________
____
____
Total delay ________

Source of data for Forest Products study.
Form for time study of loading logs on R.R. cars and analysis of hauling cost by log size.

RP FORM #36

TRUCK LOADING & TRIP TIME

Truck _____ Landing _____ Date _____
Trip No. _____ Distance _____ Observer _____

Log no.	Sp.	Diameter Sm	Diameter Lg	L	Dec.C Sc. Gr.	Dec.C Sc. Net	Def.	Cubic feet	Pro-rated travel time
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
Total									

TRIP TIME
Arr.woods
Spot
Loaded
Bind load to
Lv. W.
Arr. R.R.
Unloaded
Load dol. to
Lv. R.R.
Arr. W.
Speed. W
RR
W

RP FORM #36

TRUCK LOADING & TRIP TIME

Truck _____ Landing _____ Date _____
Trip No. _____ Distance _____ Observer _____

Log no.	Sp.	Diameter Sm	Diameter Lg	L	Dec.C Sc. Gr.	Dec.C Sc. Net	Def.	Cubic feet	Pro-rated travel time
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
Total									

TRIP TIME
Arr.woods
Spot
Loaded
Bind load to
Lv. W.
Arr. R.R.
Unloaded
Load dol. to
Lv. R.R.
Arr. W.
Speed. W
RR
W

Source of data for Forest Products study.

Form for time study of loading logs on trucks and analysis of hauling cost as related to log size.

LOG SCALE (Form #26)

MILL NO.	SPEC.	LGTH.	LARGE END Diam.	SMALL END Diam.	SCALE AND DEFECTS
					GROSS SC NET SCALE
					GROSS SC NET SCALE
					GROSS SC NET SCALE
					GROSS SC NET SCALE
					GROSS SC NET SCALE
					GROSS SC NET SCALE
					GROSS SC NET SCALE
					GROSS SC NET SCALE
					GROSS SC NET SCALE
					GROSS SC NET SCALE

Source of data for Forest Products study.
Log scaling form providing for detailed diagrams of log defects.

MILL STUDIES

Form M-1, C.F.E.S.

Project .....

Date .....

LOG SCALE

Woods No. ..... Species .....

Length, feet and inches ..... Scaled as ..... ft.

Average diameter { Small end ..... inches
Large end ..... inches

Green ..... Dead .....

GROSS SCALE (Dec. C) - - - .....

REDUCTION FOR DEFECTS
(Check Cause)

NORMAL

Rot; Shake; Int. check .....

crook .....

SURFACE

Dec. Sap; Check .....

Cat face .....

Lightning scar .....

OPERATING

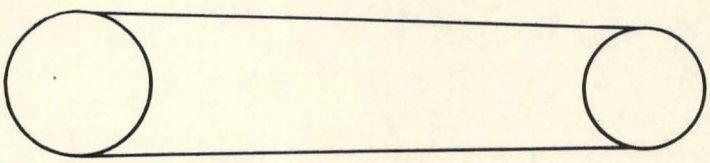
Break; Slab;

Split ends .....

MISC. ....., ...
(Cause)

TOTAL DEFECTS - .....

NET SCALE (F. S.) .....



Remarks:

Source of data for Forest Products study.

CUBIC FOOT CONTENT

..... Log No.

Gross .....

Net .....

(Ogden—5-3 29-14000)

MILL STUDIES
Form M-2 C.F.E.S.

Project .....
Date .....

LOG DESCRIPTION

Woods No. ..... Species .....

LOG GRADE

Woods .....

Mill .....

Position in tree: Butt ..... : Middle ..... (No.) : Top .....

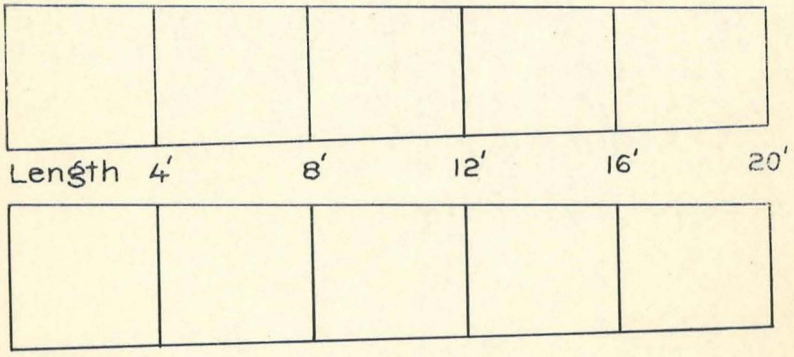
Tree class .....

Avg. thickness of sap. small end ..... inches

Surface appearance { Smooth ..... / Medium ..... / Rough .....

Spiral grain: Slight ..... ; Mod. ..... ; Severe .....

Number of knots 1" ..... 2" ..... 3" ..... 4" ..... 5" ..... 6" .....



(Write in figures to indicate knot diameters)
(Dots indicate knots less than 1" diameter.)
When knots are too numerous to record individually, write in diagram
SK for numerous small knots.
LK for numerous large knots.

Remarks:

~~475~~

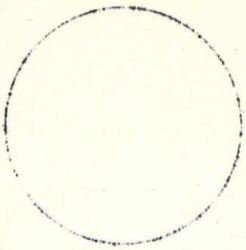
~~573~~

..... Log No.

[OGDEN-5-2-29-14,000]

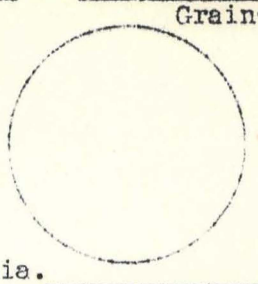
Form 1. LOG MEASUREMENTS AND DESCRIPTION

_____ Woods No. RIG #_____ Date_____



Ht. Rot
Spot Rot
Rift Crack
Split
Shake
COMP. WD.
Lt.
Mod.
Severe

Grain-



Dia._____ Dia._____

0 2 4 6 8 10 12 14 16 18 20

0 4 8 12 16 20 24 28 32 36 40

KNOTS: live_____;dead_____;sap_____

Spiral grain_____;birdseye_____

GRADE: IG (Clr. G.pen) I (Clr.) II (Sap kn.) III (Two th.kn.) IV (Th.kn. $\leq \frac{\text{diam.}}{10}$) V (Rough)

SCALE AND CULL:

Heart rot_____

Spot rot_____ (GROSS SCALE)

Rift crack_____

Split_____

Shake_____

Fire scar_____

_____

_____

_____

_____ Total cull_____

NET SCALE_____

MILL NUMBER

Source of data for Forest Products study.

~~813~~

Log scale and description forms used in redwood mill study.

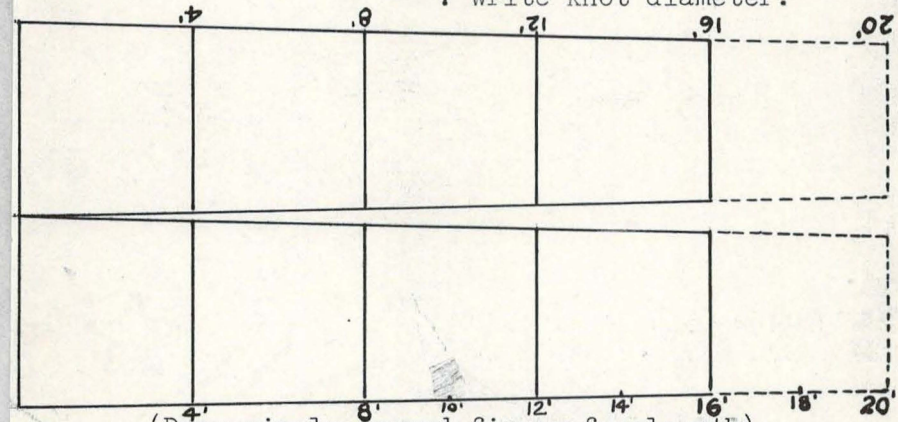
LOG DESCRIPTION AND SCALE (Form #25)

SPECIES	OLD GRADE	REVISED GRADE
PP SP DF	High.. 1..	1..2..3..4..
JP IC WF	Good.. 2..	5.. 6.. 7..
(Circle)	Fair.. 3..	5.. 6..(Small kn)
	Poor.. 4..	(Check-mark)

SYMBOLS USED IN DIAGRAMS

Bark knot-holes:
4 for 1, small •
2 for 1, medium ᵕ
Full count, smooth ×
" " , bumpy ⁎

2 for 1 pin kn. ⊥
2 for 1 bk. stubs ⊙
Bumps, no kn. holes ∩
Burls ⌭
Knots larger than 1/2", write knot diameter.



(Draw circle around figure for length)

Scaler's data

Length_____

Gross scale_____

DEFECTS:

.....

NET SCALE_____

.....large end-DIAMETER-small end.....

Log grader's description of other features and defects:

SPIRAL GRAIN
Bark scales____
Swellings_____
Wood_____
SAPSUCKER HOLES
(Note frequency and location)

BARK APPEARANCE
Thickness____in's.
Smooth...Medium...
Rough...V.Rough...
Color.....

COMP. WOOD (Describe)

GENERAL: Note esp. any signs pitch

Source of data for Forest Products study. Combination scaling and description form used in Meadow Valley study.

MILL NO_____ WOODS NO_____

Form 2. HEADSAW TIME

Mill No. 983 Woods No. _____ Rig # _____ Date _____

A.	Time	Net	
Gross ----------			
Pro. delay ------			
NET ----------			
Log delay -------			

Form 2. HEADSAW TIME

Mill No. 934 Woods No. _____ Rig # _____ Date

A.	Time	Net	
Gross ----------			
Pro. delay -----			
NET ----------			
Log delay ------			

Source of data for Forest Products study.

Field form for recording individual log sawing time, delays, and piece tally of boards cut.

EDGER TALLY (Form #29)

MILL NO. :	1 board	: 2 : 3 :	MILL NO. :	1 board	: 2 : 3 :

Source of data for Forest Products study.

Edger tally form, lumber.

Form 3. GREEN LUMBER TALLY

Sheet No. 1244 Tallyman _____ Date _____

Log No.	T.	W.	L.	G.	Log No.	T.	W.	L.	G.	Log No.	T.	W.	L.	G.	Log No.	T.	W.	L.	G.

Source of data for Forest Products study.
Field form for tallying green lumber by thickness, width, length and grade of each board cut.

CFES No. 112

Spec._____ Grade_____ Dia._____ Length_____ Log No._____

Dec.C Sc: Gross_____ Cull_____ % Def._____ Net_____ Kind Def._____

Select						Shop or Dimension								
1 & 2 Clear		C		D		3 Clear		No. 1		No. 2		No. 3		
	Ft.		Ft.		Ft.		Ft.		Ft.		Ft.		Ft.	

Common											
	No. 1		No. 2		No. 3		No. 4		No. 5		
	Ft.		Ft.		Ft.		Ft.		Ft.		

Source of data for Forest Products study.
Field form for lumber tally under different lumber grade headings.

ROUGH DRY LUMBER (Form #30)

SHEET NO. _____ Thickness _____ Species _____ Date _____

No.	LOG NUMBER	W in.	L ft.	RGHDRY GR	RGHDRY r	RGHDRY t	MARKED GR	MARKED r	MARKED t	DEFECTS (and notes)
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
49										
50										

Source of data for Forest Products study.
Rough-dry lumber tally form.

Sheet No. LUMBER TALLY (Form #24) Date

No.	T:	W"	L'	Gr:	R:	T:	Sp:	Board defects	No.	T:	W"	L'	Gr:	R:	T:	Sp:	Board defects

Source of data for Forest Products study.
Field form for surfaced lumber tally.

LUMBER INSPECTION

Log No. _____ AD _____ KD _____

	T	W	L	GS	GB	Bd. ft.	St.	Defects
A								
RA								
NS								
RN								
G								
RG								

LUMBER INSPECTION

Log No. _____ AD _____ KD _____

	T	W	L	GS	GB	Bd. ft.	St.	Defects
A								
RA								
NS								
RN								
G								
RG								

LUMBER INSPECTION

Log No. _____ AD _____ KD _____

	T	W	L	GS	GB	Bd. ft.	St.	Defects
A								
RA								
NS								
RN								
G								
RG								

LUMBER INSPECTION

Log No. _____ AD _____ KD _____

	T	W	L	GS	GB	Bd. ft.	St.	Defects
A								
RA								
NS								
RN								
G								
RG								

LUMBER INSPECTION

Log No. _____ AD _____ KD _____

	T	W	L	GS	GB	Bd. ft.	St.	Defects
A								
RA								
NS								
RN								
G								
RG								

Specimen form for Forest Products study.

Individual board form used in office analysis of insect-tree lumber production. These are cut into six individual tickets for sorting.

________ KD AD

	Gr.	Thk.	W	L	Bd.ft.	Def.
F.Pc.						
Green						
Dry						
Surf.						

________ KD AD

	Gr.	Thk.	W	L	Bd.ft.	Def.
F.Pc.						
Green						
Dry						
Surf.						

________ KD AD

	Gr.	Thk.	W	L	Bd.ft.	Def.
F.Pc.						
Green						
Dry						
Surf.						

________ KD AD

	Gr.	Thk.	W	L	Bd.ft.	Def.
F.Pc.						
Green						
Dry						
Surf.						

________ KD AD

	Gr.	Thk.	W	L	Bd.ft.	Def.
F.Pc.						
Green						
Dry						
Surf.						

________ KD AD

	Gr.	Thk.	W	L	Bd.ft.	Def.
F.Pc.						
Green						
Dry						
Surf.						

________ KD AD

	Gr.	Thk.	W	L	Bd.ft.	Def.
F.Pc.						
Green						
Dry						
Surf.						

________ KD AD

	Gr.	Thk.	W	L	Bd.ft.	Def.
F.Pc.						
Green						
Dry						
Surf.						

Specimen form for Forest Products study.
Form for individual board records, to be cut up into small tickets for sorting and summarizing by log number.

CF&RES-302

LUMBER TALLY COMPARISON - EDGER, GREEN CHAIN, ROUGH DRY

LOG NUMBER _____ DIAM. .....in's LENGTH .....feet

SCALE, FT. B.M.

Mill GROSS .....

CULL .....

Woods NET .....

	Lumber Tally	
	Pieces	Feet B.M.
Edger	.....	.....
Green chain	.....	.....
Rough dry	.....	.....

Lgth feet	4"			6"			8"			10"			12"																				
	E	G	D	E	G	D	E	G	D	E	G	D	E	G	D	E	G	D	E	G	D	E	G	D	E	G	D	E	G	D	E	G	D
6																																	
8																																	
10																																	
4" 12																																	
4 14																																	
16																																	
18																																	
20																																	
6																																	
8																																	
10																																	
6" 12																																	
4 14																																	
16																																	
18																																	
20																																	
6																																	
8																																	
10																																	
12																																	
14																																	
16																																	

Specimen form for Forest Products study.
Form for comparing lumber tallies for individual logs.

Log No. _____ Grade _____ Diam. _____ Lgth. _____

S	3	4	5	6	7	8	9	10	12	14	16	18	20
1x3													
4													
6													
8													
10													
12													
2x3													
4													
6													
8													
10													
12													

Specimen form for Forest Products study.

Office form for compiling redwood lumber production by logs.

Compilation Form. Gross scaled volumes, Scribner Dec. C, by log diameter and log grade, in different sizes of trees.

Spec.	D.B.H. in.	Height, logs	Trees No	Average dbh	Log grades and diameters								Total
					1	1-	2A	2	3	3d	4A	4	
	7						7		7			7	
	8						8		8			8	
	9						9		9			9	
	10						10		10			10	
	11						11		11			11	
	12						12		12			12	
	13						13		13			13	
	14						14		14			14	
	15						15		15			15	
	16						16		16			16	
	17						17		17			17	
	18						18		18			18	
	19						19		19			19	
	20						20		20			20	
	21						21		21			21	
	22						22		22			22	
	23						23		23			23	
	24						24		24			24	
	25						25		25			25	
	26						26		26			26	
	27						27		27			27	
	28						28		28			28	
	29						29		29			29	
	30						30		30			30	
	31						31		31			31	
	32						32		32			32	
	33						33		33			33	
	34						34		34			34	
	35						35		35			35	
	36						36		36			36	
	37						37		37			37	
	38						38		38			38	
	39						39		39			39	
	40						40		40			40	
	41						41		41			41	
	42						42		42			42	
	43						43		43			43	
	44						44		44			44	
	45						45		45			45	
	46						46		46			46	
	47						47		47			47	
	48						48		48			48	
	49						49		49			49	
	50						50		50			50	
	51						51		51			51	
	52						52		52			52	
	53						53		53			53	
	54						54		54			54	
	55						55		55			55	
	56						56		56			56	
	57						57		57			57	
	58						58		58			58	
	59						59		59			59	

Specimen form for Forest Products study.

CLEAR					COMMON					TOTAL	VALUE				
V.G. 08	K.D. 07	Ht. 06	A 05	B 04	1 01	2 02	3 03	Bnch 20	Shop 10	tally	Log	M B.M.			

Specimen form for Forest Products study.

Special form for summarizing redwood log production of lumber grades and values.

C.F.&R.Exp.Sta. Form #33

LOG NUMBER _____ Diameter & length _____ X _____ Taper	LUMBER GRADE	LUMBER GRADES PRODUCED: ROUGH DRY Shorts	ROUGH DRY All sizes	SURFACED Shorts	SURFACED All sizes
		Percent of mill-run tally			
SCALE, SCRIB.DEC.C	#1 & 2 Clear				
Gross.....	C Select				
Cull.....	D Select				
NET.....	Subt. Selects				
LUMBER TALLY Feet b. m.	#3 Clear(thick)				
	#3 Clear 4/4				
MILL RUN.....	#1 Shop				
ROUGH DRY	#2 Shop				
#4 & Better..	Aus.or Pitchy Sel				
#5 & Better..	Molding Stock				
SURFACED	Subt. Shop				
#4 & Better..	#1 Common 4/4				
#5 & Better..	#1 Common(thick)				
	#2 Common 4/4				
PERCENT OVERRUN(+) OR UNDERRUN(-)	#2 Common(thick)				
	Subt.#1&2 Common				
ON NET SCALE	Inch Shop				
MILL RUN.....	#3 Shop				
ROUGH DRY	#3 Common 4/4				
#4 & Better..	#3 Common(1 Box)				
#5 & Better..	#3 Common(2 Box)				
SURFACED	Subt.#3 Com&Shop				
#4 & Better..	#4 Common(1 Box)				
#5 & Better..	#1 Box				
	#4 Common(2 Box)				
	#4 Common(CullBx)				
	Subt.#4 & 1 Box				
	SUBT.#4 & BETTER				
	#5 Common(2 Box)				
	#2 Box				
	#5 Common(CullBx)				
	Subt.#5 & 2 Box				
	TOTAL #5 & BETTER				
	Cull Box(no Com.)				
	Culls				
	Loss Trim & Rip				
	TOTAL MILL RUN				

Specimen form for Forest Products study.

Form for recording the rough-dry and surfaced lumber production, scale, cull, etc., for individual pine logs.

Lumber Production Summary

Log Diam. Grp._____ inches. Green ___ Rough dry ___ Surfaced ___ (Check one)

LOGS -		No.		No.		No.		No.		No.		No.	
		Log Grade		Log Grade		Log Grade		Log Grade		Log Grade		Log Grade	
Grade	W	4/4	5/4+	4/4	5/4+	4/4	5/4+	4/4	5/4+	4/4	5/4+	4/4	5/4+
B and Btr.	4												
	6												
	8												
	10												
	12												
C Sel.	4												
	6												
	8												
	10												
	12												
D Sel.	4												
	6												
	8												
	10												
	12												
3 Clr.	R												
1 Sh	R												
2 Sh	R												
Mldg	R												
Aust	R												
3 Sh	R												
#1 Com.	4												
	6												
	8												
	10												
	12												
#2 Com.	4												
	6												
	8												
	10												
	12												
#3 Com.	4												
	6												
	8												
	10												
	12												
#4 Com.	4												
	6												
	8												
	10												
	12												
#5 C	R												
1 Box													
2 Box													
C Box													

Specimen form for Forest Products study.

Form for summarizing lumber production from groups of similar pine logs by grade, thickness, and width.

Log grade____ Dia. grp._____ Spec.____ WITH WITHOUT STAIN

	Class 1			Class 2			Class 3			Class 4		
Grade	bd ft	%	Value	bd ft	%	Value	bd ft	%	Value	bd ft	%	Value
B&Btr												
C Sel												
D Sel												
Short												
Stain												
Sub-t												
Ø-4/4												
"stn												
Ø-thk												
"stn												
#1 Sh												
"stn												
#2 Sh												
"stn												
Mldg												
Aust												
Ø-Au												
B-Aus												
1 Com												
2 Com												
2CBtr												
In.Sh												
"stn												
#3 Sh												
"stn												
3 Com												
3CBtr												
4 Com												
5 Com												
1 Box												
2 Box												
C.Box												
4C-CB												
TOTAL												
1 BOX												
2 BOX												
C BOX												
TotBX												

LOGS	Total	%	Avg.	Total	%	Avg.	Total	%	Avg.	Total	%	Avg.
Numbr												
Diam.												
Gr.Sc												
DefOt												
DefSt												
NetNS												
NetST												

PERCENT OVERRUN (- Sign indicates underrun)

	3CBtr	4C +	5CBtr	3CBtr	4C +	5CBtr	3CBtr	4C +	5CBtr	3CBtr	4C +	5CBtr
Gr.Sc												
NetNS												
NetST												
VperM												

Specimen form for Forest Products study.

Special form for summarizing lumber production from logs cut from insect-infested trees.

Mill #	TREE#	D.B.H.	5"	TREE C	AGE	5yr	AVG GR	W LOG#	POS	MILL D	5"	LGTH	GRADE

SCALE DEC C		CUBIC FEET		TAPER	SAW TIME	LOG DEFECT		BARK THK	WOODS	TREE	STUMP
Gross	Net	Gross	Net		Net	%	Kind		LOG	COUNT	DIA.

LUMBER TALLY

Full pc	True	green	Rough dry	Surfaced					

Specimen form for Forest Products study.

Form for summarizing all classes of data by individual logs.

CF&RES-325

WOODS COSTS AND SUMMARY OF TOTAL COSTS AND VALUES

D.B.H. Group _____ Avg. D.B.H. _____ Avg. Height _____

Woods Log d.i.b.	Woods cuts: No.	Woods cuts: Inches	Woods cuts: Avg.	Bucking Cost	Vol.: Gross Scale	Volume Class	Woods Logs: No.	Woods Logs: Volume	Total d.i.b.	Yarding Cost	Loading Cost	Trans. Cost
6- 9						1- 10						
10-13						11- 20						
14-17						21- 30						
18-21						31- 46						
22-25						41- 60						
26-29						61- 80						
30-33						81-100						
34-37						101-120						
38-41						121-140						
42-45						141-160						
46-49						161						
50-53												
54-57												
58-61												
Totals												

Gross Scale	Total	Per M Gr. Sc.	Net Scale	Total	Mill Tally: Per M Tally
Felling Cost			Sawing to green sorter		
Limbing Cost			Other plant		
Bucking			Gen. expense		
Yarding					
Loading					
Transportation					
Unloading					
Cost in Pond			TOTAL MILL		
Per M Gross Scale			Plant cost per M tally		
Per M Net Scale			Woods " " " "		
Per M Tally			TOTAL Felling to Shipping Lumber		

Specimen form for Forest Products study.

Form for summary of cost data by log diameter groups

MILL-LOG COSTS AND VALUES

Species _____ D.B.H. _____ Total D.B.H. _____ Ave. D.B.H. _____

No. Trees _____ Total No. Trees

Total Height, Logs Ave. Height

Grade	9	13	17	21	25	29	33	37	41	45	49	53	57	61
1. Logs														
Scale														
Tally														
S.Cost														
M.Cost														
Value														
2A														
Scale														
Tally														
S.Cost														
M.Cost														
Value														
2 B														
Scale														
Tally														
S.Cost														
M.Cost														
Value														
3 Logs														
Scale														
Tally														
S.Cost														
M.Cost														
Value														
4 H														
Scale														
Tally														
S.Cost														
M.Cost														
Value														
4														
Scale														
Tally														
S.Cost														
M.Cost														
Value														
Total														
Scale														
Tally														
Value														

Specimen form for Forest Products study.

TREE D.B.H. ____ : Class ____ : Age ____ yrs: Bark thickness at b.h. ____

Log data and lumber production

Position of log in tree (butt = 1)

	1	2	3	4	5	. . . . .
D.i.b., inches						
Length, feet						
Log grade						
SCALE, BD.FT.						
Gross						
Cull						
Net						
TALLY, BD.FT.						
Full piece						
Net green						
Rough dry						
Surfaced						
CUBIC FEET						
Gross log						
Lumber						
Surf. lumber						
OVERRUN %						
F.pc./Net sc.						
Surf./Net sc.						
Surf./Gr. sc.						
SURFACED LUMBER GRADES IN PERCENT OF SURFACED TALLY						
B and Better						
C Select						
D Select						
Short Select						
Subtot. Select						
No.3 Clear						
No.1 Shop						
No.2 Shop						
Pitchy Sel.						
Mldg. Stock						
Subt 3 Clr-M						
No.1 Common						
No.2 Common						
Subt 1&2 Com.						
No.1 Dimension						
#1 DIM & BTR						
No.3 Shop						
No.3 Common						
Subt 3Sh&3Com						
No.1 Box						
No.2 Dimension						
No.4 Common						
Subt 1B-2D-4C						
Cull Box						
No.3 Dimension						
No.5 Common						
Subt CB-3D-5C						
SURFACED LUMBER SELLING VALUE, DOLLARS						
M.B.M.surf.tal						
Per log						
M B.M.gross sc						

Specimen form for Forest Products study.

Form for summarizing lumber production, etc., from each log in one tree and computing the total tree production.

Specimen form for forest products study.

McCLOUD TREES

TREE NO.____
DBH _____" Double bark thickness, stump _____"
AGE _____yrs. Utilized length to ___" top ____ft.
CLASS ____(D) Brkg/cull left below ut. top ____ft.
Merch. length to 8" top ____ft.
TOTAL HEIGHT, ground to tip ____ft.

LOG DATA AND VALUES 1936 LIST PRICES

Log no.	DIB in.	L ft.	Gr. sc.	Surf. tally	Value of Log Green	R.Dry	Surf.	Per M surf.
TREE								
Values per M B.M.								
Val's MBM net gr.tally								

PERCENT OF TOTAL LUMBER TALLY BY GRADES

GRADE	Net Gr.	Rgh.Dry	Surf.
D & Better			
#3 Clear			
#1 Shop			
#2 Shop			
Mldg.; P. Select			
#1 and 2 Common			
#1 Dimension			
#3 Shop; Inch Shop			
#3 Common; #2 Dim.			
#1 Box			
#4 Common; #2 Box			
#5 Com;Cull Box;#3 Dim			
Mldg. Strips			
Loss			
Depreciation, % of Net Gr. Val.			
" % of Rgh. dry Value			

McCLOUD TREES

TREE NO.____
DBH _____" Double bark thickness, stump _____"
AGE _____yrs. Utilized length to ___" top ____ft.
CLASS ____(D) Brkg/cull left below ut. top ____ft.
Merch. length to 8" top ____ft.
TOTAL HEIGHT, ground to tip ____ft.

LOG DATA AND VALUES 1936 LIST PRICES

Log no.	DIB in.	L ft.	Gr. sc.	Surf. tally	Value of Log Green	R.Dry	Surf.	Per M surf.
TREE								
Values per M B.M.								
Val's MBM net gr.tally								

PERCENT OF TOTAL LUMBER TALLY BY GRADES

GRADE	Net Gr.	Rgh.Dry	Surf.
D & Better			
#3 Clear			
#1 Shop			
#2 Shop			
Mldg.; P. Select			
#1 and 2 Common			
#1 Dimension			
#3 Shop; Inch Shop			
#3 Common; #2 Dim.			
#1 Box			
#4 Common; #2 Box			
#5 Com;Cull Box;#3 Dim			
Mldg. Strips			
Loss			
Depreciation, % of Net Gr. Val.			
" % of Rgh. dry Value			

CMRS 332

TREE VALUATION PLOT___
No_____ DBH____ (_____)Logs_____ Sp___
CLASS-D___ K___ S___ QUALITY_____
C.SYSTEM-:SScut lv :FScut lv :FSMcut lv
Dia L Gr GSc Tally Value Cost Defects

TOTAL MER.

TREE VALUATION PLOT___
No_____ DBH____ (_____)Logs_____ Sp___
CLASS-D___ K___ S___ QUALITY_____
C.SYSTEM-:SScut lv :FScut lv:FSMcut lv
Dia L Gr GSc Tally Value Cost Defects

TOTAL MER.

TREE VALUATION PLOT___
No_____ DBH____ (_____)Logs_____ Sp___
CLASS-D___ K___ S___ QUALITY_____
C.SYSTEM-:SScut lv :FScut lv :FSMcut lv
Dia L Gr GSc Tally Value Cost Defects

TOTAL MER

TREE VALUATION PLOT___
No_____ DBH____ (_____)Logs_____ Sp___
CLASS-D___ K___ S___ QUALITY_____
C.SYSTEM-:SScut lv :FScut lv:FSMcut lv
Dia L Gr GSc Tally Value Cost Defects

TOTAL MER

TREE VALUATION PLOT___
No_____ DBH____ (_____)Logs_____ Sp___
CLASS-D___ K___ S___ QUALITY_____
C.SYSTEM-:SScut lv :FScut lv :FSMcut lv
Dia L Gr GSc Tally Value Cost Defects

TOTAL MER.

TREE VALUATION PLOT___
No_____ DBH____ (_____)Logs_____ Sp___
CLASS-D___ K___ S___ QUALITY_____
C.SYSTEM-:SScut lv :FScut lv:FSMcut lv
Dia L Gr GSc Tally Value Cost Defects

TOTAL MER.

Specimen form ~~for Forest Products study.~~
~~Ticket form (cut up) for individual trees, one log~~
~~listed on each line.~~

CF&RES-535

BIBLIOGRAPHICAL RESEARCH
FOREST SURVEY
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION

File designations:

County Nevada Geographical location Truckee river basin

Specific subject matter

Subject matter (Check appropriate item.):

1. Vegetation of specific areas to 1870
2. Records of the amount of standing timber of specific areas to 1910
3. Fires to 1930
4. Lumbering operations to 1920
   - x a. Location, period of use, output (board feet) of sawmills
   - b. Logging (amount of timber cut)
5. Other forest utilization operations to 1920
   - a. Tanbark exploitation
   - b. Lime kilns
   - c. Paper mills
   - d. Turpentine & naval stores
   - e. Powder mills
   - f. Charcoal burning
   - g. Mining
   - h. Fuel wood
6. Records of lumber and other forest product shipments and/or consumption to 1920
7.

Book Periodical Newspaper x U. S. Document

Author Year of publication 1879

Title Sawmills of Truckee Basin

Edition (if later than the first) No. of pages Maps Illustrations

Title of publication The Truckee Republican

Vol. VIII No. 9 Page 2 col 1 Month Dec. Day of month 21

Publisher Place of publication Truckee

Library Banc. Call number Date of abstract 10 11 By Peck

Specimen form for survey study.

Truckee:

It is situated in theheart of the timber belt and is nearly in the center of the 300 square miles composing Truckee Basin. Its sawmills manufactured the lumber which built the snow sheds of the Sierras, the ties and bridge timbers of the Central Pacific and maintains a brisk lumber trade throughout Nevada, Utah and southern Idaho. Virgin forests of magnificent timber extend in every direction. The most important mills are: Truckee Lumber Co., Richardson Bros., Schaffer, Ellen, Lonkey and Smith, Martin and Leach, Kneeland, Boca Mill and Ice Co., and the Clinton mills of the Pacific Lumber Wood Co. These mills all have capacities ranging from thirty to seventy thousand feet of lumber a day. The Truckee wood business is enormous. One wood firm, Sisson, Wallace & Co., have contracts to furnish 10,000 cords annually for the next ten years.

CF&RES-535

BIBLIOGRAPHICAL RESEARCH
FOREST SURVEY
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION

File designations:

County San Bernardino Geographical location Pinecrest vicinity

Specific subject matter

Subject matter (Check appropriate item.):

1. Vegetation of specific areas to 1870
2. Records of the amount of standing timber of specific areas to 1910
x 3. Fires to 1930
4. Lumbering operations to 1920
   a. Location, period of use, output (board feet) of sawmills
   b. Logging (amount of timber cut)
5. Other forest utilization operations to 1920
   a. Tanbark exploitation
   b. Lime kilns
   c. Paper mills
   d. Turpentine & naval stores
   e. Powder mills
   f. Charcoal burning
   g. Mining
   h. Fuel wood
6. Records of lumber and other forest product shipments and/or consumption to 1920
7.

Book Periodical Newspaper x U. S. Document

Author Year of publication 1911

Title Forest fires

Edition (if later than the first) No. of pages Maps Illustrations

Title of publication Riverside Daily Press

Vol. XXVI No. 183 Page 1 col 1 &2 Month August Day of month 2

Publisher Place of publication Riverside

Library Bancr. Call number Date of abstract 8-9 By Peck

Specimen form for survey study.

The San Bernardino forest fire is sweeping desertward with unabated fury, leaving denuded mountain sides and charred and blackened timber in its wake. Thirty square miles have been burned over.

The fire this morning crossed the summit at Arrowhead Heights and swept through Clifton Heights. Huston Flats were swept, Seeley Flats burning; the fire then took a northwesterly course and headed for the desert.

Another wing of thefire crossed the ridge from Strawberry to the Palmer ranch, then through Grass Valley. It is now headed for the heavy timber on Bald Heights.

Another branch of the fire was headed off from Little Bear Valley and the Burnt Mill district.

The fire in the City Creek district is just approaching the ridge.

Vol. XXVI, No. 184, p. 1, Col. 1, Aug. 3, 1911.

The reports this morning: From Burnt Mills Ranger Station to Fredalba and Pine Crest the fire is under control. The fires in Burnt Mill Creek and Grass Valley are also controlled. The fire on the ridge near Heap's ranch was checked a mile from Guerney's mill. The fire has burned west to Dark Canyon and will be stopped there. The only fire now burning on this side of the mountain is in City Creek Canyon.

(Field Label)

CALIFORNIA FOREST EXPERIMENT STATION

VEGETATIVE TYPE MAP HERBARIUM

Herbarium No.....

Botanical Name.....

Common Name.....

Quadrangle..... No.....

County..... Elev.....

National Forest.....

Locality.....

Sec..... T..... R.....

Collector..... Date.....

Vegetative Type..... Slope.....

Associate Species.....

Tree..... Height..... D.B.H.....

Sprouting.....

Shrub..... Height..... Non-sprouting.....

Herb..... Height..... Vine.....

Remarks.....

Source of data used in the survey herbarium study.

Herbarium No......

U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION

VEGETATION TYPE MAP HERBARIUM

(Label for mounted specimen)

Locality.....

Quadrangle..... Sec..... T..... R.....

Collector..... No.....

Date..... Remarks.....

(OAKLAND-11-20-36-15000)

Specimen form used in herbarium study.

Arctostaphylos silvicola Jepson 8091

Santa Cruz (Santa Cruz Co.)
Near Bonnie Doon, Waterhouse Place
Sec. 13, T.10S, R. 3W

H.S. Yates 2/3/35 Elev. 1500
5020

(Quadrangle file card)

112

Arctostaphylos silvicola Jepson 8091

Collector H.S. Yates
Quad. Santa Cruz County Santa Cruz
Collector's No. 5020 Date 2/3/35

Duplicates sent to:
Washington
U.C. Herbarium
Others.

(Numerical file card)

112

Specimen forms used in the survey herbarium study.

Form 767
(Revised Apr. 1928)

U. S. DEPARTMENT OF AGRICULTURE

Collector's No. _____ Date of collection _____

Botanical name _____

Common name _____

State _____ County _____ Forest _____

Exact locality _____
(Sec., T., and R., Thompson Meadow)

Altitude _____ feet. Slope _____ Soil _____
(Steepness and direction) (Deep clay loam, shallow coarse gravel, etc.)

Type _____
(Woodland, timber, park, etc.) (Weed, browse, grass) (Density in tenths)

Use _____
(Principal associated plants in order of abundance) (Overgrazing, close, moderate, light)

Distribution _____ Abundance _____
(Where generally found)

Forage value _____
(Palatability) (Grazed by C., H., S., and G.) (Season grazed)

Other data _____
(Usual size of plant) (Flowering period) (Period of seed dissemination) (Other notes)

Collector's name _____

U. S. GOVERNMENT PRINTING OFFICE 8—1561

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
VEGETATION TYPE MAP HERBARIUM

(Annotation Label)

Det. Date

Specimen forms used in the survey herbarium study.

(J Label)

CALIFORNIA FOREST EXPERIMENT STATION

VEGETATIVE TYPE MAP HERBARIUM

Herbarium No._____

Botanical Name_____

Common Name_____

Quadrangle_____ No._____

County_____ Elev._____

National Forest_____

Locality_____

Sec._____ T._____ R._____

Collector_____ Date_____

Vegetative Type_____ Slope_____

Associate Species_____

Tree_____ Height_____ D.B.H._____

Sprouting_____

Shrub_____ Height_____ Non-sprouting_____

Herb_____ Height_____ Vine_____

Remarks_____

Specimen form used in the survey herbarium study.

251
M62
1938

Statistical methods applied to economics and business.

Mills, Frederick Cecil

Statistical methods applied to economics and business. Rev. New York, Henry Holt and company, c1938.

746 p.

"List of references": p.727-736.

This is a sample title card.

251
M62
1938

Mills, Frederick Cecil

Statistical methods applied to economics and business. Rev. New York, Henry Holt and company, c1938.

746 p.

"List of references": p.727-736.

This is a sample author card.

over

U.S. Bureau of foreign and domestic commerce. (Dept. of commerce)
Trade promotion series.

99.75
N39H

no.178. Neubrech, W.L. American hardwoods and their uses. 1938.

99.75
N39A

no.180. Neubrech, W.L. American western pines and their uses. 1938.

This is a sample series card.

Specimen card forms used by the library group.

Statistics

251
M62
1938

Mills, Frederick Cecil
Statistical methods applied to economics and business. Rev. New York, Henry Holt and company, c1938.
746 p.

"List of references": p.727-736.

This is a sample subject card.

per.

Lowdermilk, Walter Clay, 1888-
Some aspects of research in the Soil conservation service.
(In Soil conservation 1(5):1-7. Dec., 1935)

This is a sample author card for article in a magazine. Tracing on back indicates subject card which will be made for it.

Specimen card forms used by the library.

PART II

STATEMENT OF ACCOMPLISHMENTS

O.P. 365-03-3-35, Area Serial 0803-1589

"A STUDY OF CALIFORNIA FORESTS"

A. ACCOMPLISHMENTS

1. Forest Management. On the redwood section of the forest management study a great many miscellaneous calculations were made for the yarding study; the bulk of the work, however, was done by the Station's technical men. On their redwood falling, bucking and peeling study all of the necessary calculations in analyzing the cost of falling, bucking and peeling of redwood trees by size for Mendocino County was done by WPA employees. A periodical article is being prepared showing the results of this study. On the natural reproduction study the carding of the field records of four examinations of 328 plots has been completed, which involves 8,200 cards; however this is only a small percentage of the work to be done on this long-time study. On the volume table construction study about 75% of the work has been completed which covers plotting of taper curves, calculation of volume and top diameter ratios and calculation of volume equations for preliminary tables; this will not be completed for several years. The calculation of breakage in falling for redwood trees has been completed for a Mendocino County lumber company. Calculations of transportation costs by log sizes for two lumber companies have been completed, as has a study of the conversion of falling, bucking, peeling, and railroad transportation costs to costs by tree size and then converting to index numbers by tree size based on average cost of $1.00 per M.

The work completed on the pine branch of this study involved computing and drafting and it was all of a continuous nature incidental to

going Station research on forest management.

2. Range. Chief accomplishments on the range conservation study have been aid furnished in the assembly and computation of data for the counties of San Benito, Madera, and Merced as a part of the cooperative Western Range Survey, and the coloring of 6 photographic enlargements and 150 lantern slides relating to range research. The latter are used to illustrate talks on range management that are given before interested groups of stockmen, ranchers, etc.

3. Fire. On the fire project coding and punching of individual fire reports have been completed for 13 years - from 1925 to 1938, or a total of 20,000 reports have been coded and checked. In addition, 1,200 suppression crew reports have been coded and checked. This information will be used to determine means and methods of improving forest fire protection practices in the forests of California. The work has reached the point where the next step is sorting and tabulation of the data for for final results. It is estimated that about 60 percent of the work on the study has been completed.

4. Forest Influences. Accomplishments on the forest influences study are as follows: about 50 percent of the compilation, summarization and analysis of current and accumulated data collected at the field installations have been completed; about 40 percent of the work relative to the collection of records and maintenance of the Berkeley surface run-off and erosion plot and lysimeter installations has been done; 10 percent of the experimental soil laboratory work and analysis has been completed; 10 percent of the maps, charts, graphs, slides for

lectures, publications, etc., have been completed; and 30 percent of the nursery and seed research work has been completed. The results are being incorporated in the Station's erosion and flood control, water conservation, and administrative program as a basis for watershed management practices in California.

5. Forest Products. On the forest products study the biggest accomplishments of the work on the general lumbering study has been the perfection of more accurate analytical methods and the exposure of fallacies in certain statistical methods previously used, and still being used in other regions, in allocating costs to log and tree size. On the West-Side Pine Region study the log grade production for different sizes of ponderosa pine and sugar pine logs have been recompiled on the basis of a tentative revised set of log grading rules. On the Woods Operation Studies, Lassen Project of 1934, a large amount of work was done on the yarding and railroad transportation phases involving a comparison of different methods of allocating load costs to log size in unit loads of randomly mixed sizes. On the McCloud River Lumber Company study grade production, both rough-dry and surface have been summarized for each log and each tree observed in this study; the data will be revised in accordance with the new log grades. On the Black's Mountain Experimental Forest Study data on the relative costs and values of different sizes of logs and trees and on the relative returns from different systems of cutting were prepared for a preliminary mimeographed report which will be revised for general distribution later. On the Redwood Region study comparative costs, values, and returns from different sizes of trees and from cutting to

different tree-diameter limits were calculated. Lumber grade production was compiled for the trees cut in the 1935 salvage study and the degrade caused by infestation was analyzed. There have been a variety of tables and charts completed for use in analyzing logging and milling study data.

6. Forest Economics. On the forest economics project compilation has included data on the relation of climate to vegetation and forest growth, and of reference data on allied phases; computation has included cost and returns studies of sawmill conversion of second growth pine stands in the area and of livestock enterprises in the foothills and mountains; and the drafting forces, which are aided by workers from the Giannini Foundation, have completed about 90 percent of their large scale maps which are used in connection with this study. This information will be used in a land utilization report which will have wide usage by executive agencies of land administration.

7. Forest Survey. On the forest survey study the office work has been completed for 23,060,000 acres, or 40 percent of the study. There have been 137 forest resource maps completed, or 5 percent of the total needed. Maps have been completed for 14 fifteen-foot quadrangles and for four thirty-foot quadrangles, 12 maps are in process of completion. The following type maps on which acknowledgement of WPA assistance is noted are in Washington and will be printed as soon as funds become available for this purpose: - Santa Paula, Ventura, San Juan Bautista, New Almaden, Deep Creek, Hesperia, Santa Cruz, and Tejon. On the species distribution maps the dominant and individual occurrence for 44 individual species for an area in southern California comprising 14,446 square miles has been completed. Research data pertaining to past fires and timbering operations for 5 Nevada and 21 California counties, or approximately 16,000 abstracts covering a period from the earliest available date up to and including

1920 have been completed. It is proposed to complete this information for each county in California. Numerous charts, graphs, and other descriptive material have been prepared for various conferences and investigative meetings. In the herbarium identification, mounting and strapping, and filing of specimens, including clerical work for all specimens, have been completed for 12,500 specimens for the vegetation type map study, and 10,000 for the University of California herbarium. Duplicate specimens in the amount of 15,312 have been prepared for the University of California herbarium, and 3,300 for the Forest Service Herbarium in Washington, D.C. Checking determinations in the herbarium for over 23,000 plants has been done. Field keys and charts have been compiled for Artemisia and Chrysothamnus. Keys and Charts for California Species of Atriplex was published. See page 98 for copy of Technical Note No. 8. Preliminary studies on the genus Arctostaphylos preparatory to publishing a series of papers on this group have been made. Research on the genus Helianthemum has been practically completed; and results are to be published early in 1939. The accomplishments on this section of the project are an important part of the Station's Vegetation Type Survey and Timber Inventory of California.

8. Genetics. The cytological study has completed the making of 750 slides; material has been embedded on 204 slides; and other slides in process total 480. This material will be used for research work when it is completed. On the physiological section of the genetics study they are working on the development of a suitable technique for the nutrition

work. A satisfactory technique for the hormone study has been developed, and the work is now concentrating on hormone content in fast and slow growing trees. The work on this study is in an early state of development and it is difficult to say just how much of it has been completed and how far it will be possible to develope it. Results of this study will be incorporated in the Station's tree breeding work.

9. Library Reference Work. The library workers have completed the typing of 28,240 new cards; 85,572 cards have been filed; 6,488 articles have been recataloged; 489 periodical articles have been indexed; and 1,190 pages have been typed from material that our translator had translated.

10. Statistical Section. Accomplishments of the statistical section are incorporated in the work of the various studies.

11. Miscellaneous. Various classes of workers have done an abundance of short jobs for the general administration of the Station, involving typing, filing, general stenographic work, some bookkeeping and accounting, repairing of equipment, and building furniture that was needed by the project, operating the enlarged switchboard which was necessary with the increased number of workers, and in general making it possible to carry on the Station's and project's work.

B. PUBLICATION PLANS

The following is a list of publications either planned or in the process of preparation. All publications will contain acknowledgement of WPA assistance, noting the official project number under which the assistance was rendered, and the required number of copies will be furnished the WPA when available.

1. Papers in preparation for publication and papers planned for publication for which investigations are in progress.

a. Forest Management. On the redwood section of this study there will be publication of (1) Redwood Volume Tables. This will be a mimeographed preliminary set of volume tables and will appear in March or April. The final tables will be published in about three years. Results of the redwood natural reproduction study will be prepared as a (2) Progress Report, and (3) an article is also planned for the Journal of Forestry. This article would be limited to a discussion for some of the most definite conclusions resulting from the first three years of the study. The pine section does not contemplate any publication during 1939; however, some of the phases of the work undertaken will be incorporated in future publications.

b. Fire. On the fire study there are no definite plans for publication of work; however, a publication similar to Forest Fires in California 1911-20, prepared by the Station and Regional Office, may result from one phase of the project.

c. Forest Influences. On the forest influences study publication of results is contemplated for the year 1939 in which WPA assistance will be employed in analyzing data are: -

(1) Influence of forest vegetation on soil water relationships.

(2) Effectiveness of the San Joaquin foothill grass type in the control of surface run-off and erosion.

(3) A lysimeter study of the affects of ponderosa pine litter on surface run-off, percolation, and evaporation.

(4) Interception of precipitation by the chaparral-woodland brush type of the Sierra foothills.

(5) Influence of different depths of Monterey pine litter on surface run-off, erosion, percolation, and evaporation.

(6) A new device for measuring the infiltration rates of soil.

(7) A soil moisture study.

(8) Lysimeter studies at Oxford Street.

(9) Surface run-off and erosion from plots employing natural and artificial rainfall.

(10) Redding erosion studies, including a description of the simple devices for measuring erosion hazards.

(11) A modification of the Bouyoucos method of moisture equivalent determinations.

(12) An illustrated article for Trees Magazine.

(13) North Fork results, rewritten for the Journal of Forestry, or American Forests, or both.

(14) Descriptive pamphlet - Kings River Branch Station.

(15) A watershed laboratory for California's Great Central Valley - to be published in a scientific journal.

(16) Rainfall distribution - Sierra foothill woodland grass cover type.

(17) The unit hydrograph applied to small watersheds in the Sierra foothills.

(18) Snow melting characteristics in the High Sierra.

(19) Collecting and handling seeds of native California plants. A supplement to Technical Note No. 18.

(20) Seedling botany of native California plants.

(21) Uses of Eriodictyon species as a control plant for road erosion in California.

d. Forest Products. The forest products study plans publication of-

(1) Manual of procedure for the analysis of lumbering studies. (About March, 1939)

(2) Bulletin on the seasoning and surfacing depreciation of lumber in the California Pine Region. (Technical Bulletin - about April, 1939)

(3) Relative costs of yarding small and large trees in tree lengths, East-Side California Pine Region. (An article for trade journal publication)

(4) Costs and returns from silvicultural selection cutting on the Black's Mountain Experimental Forest. (Article for trade journal publication, about February, 1939)

(5) Comparative values of the smaller ponderosa pine trees in Site 2 virgin stands of the East-Side California Pine Region. (A summary of the McCloud River Lumber Company study - for trade journal publication)

(6) Salvage cutting of insect infested trees in the East-Side California Pine Region. (Article for trade journal publication - about June, 1939)

(7) Returns from selective cutting in a virgin redwood stand, Humboldt County. (Article for trade journal publication - about July, 1939)

(8) New log grading rules for the California Pine Region. This will include lumber grade production tables for logs of different sizes and log grades classified according to the new system, and will be illustrated by photographs of logs representing high-line, average, and low-line samples of each grade. About February, 1939)

e. Forest Economics. The economics study's plans call for a publication, however, the nature and size of it are not known at the present time.

f. Forest Survey. On the forest survey study the Vegetation Type Map units will be submitted for publication as they become ready. Drafting of the following quadrangles - Santa Paula, Ventura, San Juan Bautista, New Almaden, Deep Creek, Hesperia, Santa Cruz and Tejon - is completed and the maps have been sent to Washington to be printed as soon as funds become available for that purpose. Copies of the maps will then be sent to the WPA. A comparative study, the Northern Sierra Nevada Land Utilization Investigation, dealing with the utilization of land in the counties of Butte, Yuba, Placer, Nevada, El Dorado, and Amador, and conducted under the auspices of the Giannini Foundation of Agricultural Economics, the California Forest and Range Experiment Station, and the California Agricultural Experiment Station is nearing completion and is planned to be published in 1939. The herbarium section of this study plans to publish an article on (1) a new species of Arctostaphylos, in Madroño, early in 1939. It is intended that this paper will be the first of a series of papers on this group and will include descriptions of five new species and a variety of Arctostaphylos with special reference to stump sprouting and embryonic inflorescences as good field characters. (2) A new species of Helianthemum for California, will be published in Madroño, early in 1939. This paper describes a new species which is found in El Dorado County and discusses its relationship to the other members of that group. (3) There will also be two papers on range extension and distribution of Sierra foothill species to be published later in the year. Exact titles and dates are not known at present.

When dates are given for publications they represent the approximate time that the manuscript will be completed - the dates of actual publication cannot be forecast with accuracy.